MEDICAL LIBRARY JUL 1 1 1945

INDEX NUMBER

AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY

VOL. 49 JUNE, 1945 No. 6

Editor
GEORGE W. KOSMAK

Associate Editors
HOWARD C. TAYLOR, JR. WILLIAM J. DIECKMANN

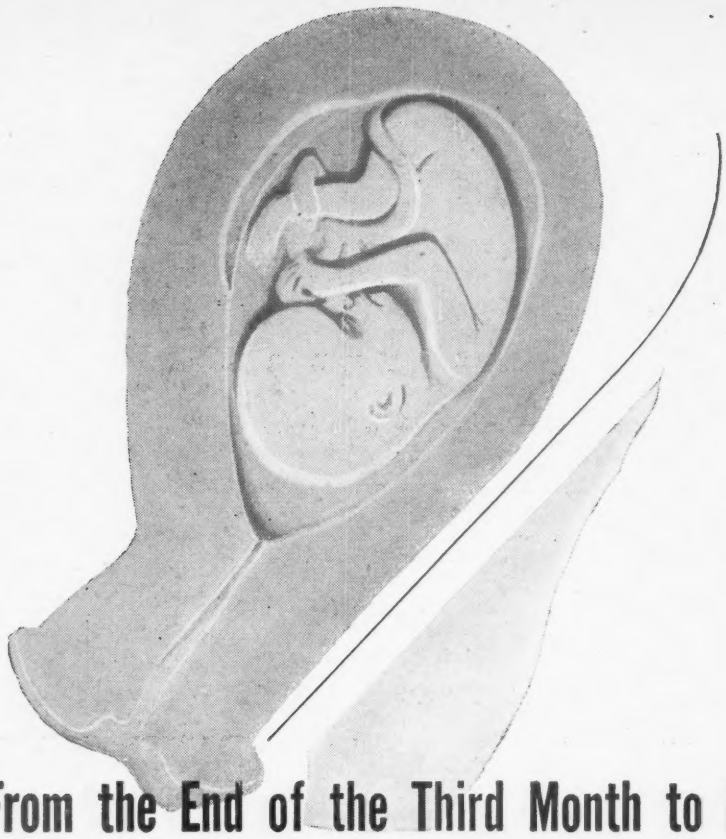
OFFICIAL ORGAN

THE AMERICAN GYNECOLOGICAL SOCIETY
THE AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS, AND ABDOMINAL SURGEONS
NEW YORK OBSTETRICAL SOCIETY; OBSTETRICAL SOCIETY OF PHILADELPHIA
BROOKLYN GYNECOLOGICAL SOCIETY; ST. LOUIS GYNECOLOGICAL SOCIETY
NEW ORLEANS GYNECOLOGICAL AND OBSTETRICAL SOCIETY
BALTIMORE OBSTETRICAL AND GYNECOLOGICAL SOCIETY
CHICAGO GYNECOLOGICAL SOCIETY; CINCINNATI OBSTETRIC SOCIETY
CENTRAL ASSOCIATION OF OBSTETRICIANS AND GYNECOLOGISTS
AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY
WASHINGTON GYNECOLOGICAL SOCIETY
PITTSBURGH OBSTETRICAL AND GYNECOLOGICAL SOCIETY
OBSTETRICAL SOCIETY OF BOSTON
LOUISVILLE OBSTETRICAL AND GYNECOLOGICAL SOCIETY
SOUTH ATLANTIC ASSOCIATION OF OBSTETRICIANS AND GYNECOLOGISTS
SEATTLE GYNECOLOGICAL SOCIETY

PUBLISHED BY THE C. V. MOSBY COMPANY, 3207 WASHINGTON BLVD., ST. LOUIS, U. S. A.

TABLE OF CONTENTS ON PAGE 6

Copyright 1945 by The C. V. Mosby Company



From the End of the Third Month to Full Term...

A reduction of 75% in the incidence of toxemia of pregnancy has been obtained by Colvin and associates[1], in a series of 349 cases, through the simple expedient of prophylactic iodine medication. To avoid the objectionable by-effects of ordinary iodine salts, the authors recommend LIPOIODINE* "Ciba" in doses of one tablet daily from the end of the third month to full term.

Iodine administration during pregnancy tends to maintain the basal metabolism close to the normal range of the non-pregnant individual.[2] It conceivably prevents cholesterol-vascular changes, and preserves adequate circulation in the placental vessels.[1]

Lipoiodine tablets contain 41% iodine organically bound. They are palatable, odorless, well-tolerated, and liberate iodine gradually for sustained action.

1. E. D. Colvin et al: Am. J. Obstet. & Gynecol., 43:183, Feb. 1942.

2. N. M. Phatak et al.: Proc. Soc. Exper. Biol. & Med., 45:667, Nov. 1940.

LIPOIODINE

*Trade Mark Reg. U. S. Pat. Off.

a Ciba Product

CIBA PHARMACEUTICAL PRODUCTS, INC., SUMMIT, NEW JERSEY

IN CANADA, CIBA COMPANY LIMITED, MONTREAL

Vol. 49, No. 6, June, 1945, American Journal of Obstetrics and Gynecology is published monthly by The C. V. Mosby Company, 3207 Washington Blvd., St. Louis (3), Mo. Subscription price: United States, its possessions, Pan-American Countries, $10.00 a year; Canada, $11.50; Foreign, $11.00. Entered as Second-Class Matter at Post Office at St. Louis, Mo., under Act of March 3, 1879. Printed in the U. S. A.

American Journal of Obstetrics and Gynecology

VOL. 49 JUNE, 1945 NO. 6

Original Communications

ESTIMATION OF THE WORK OF OBSTETRIC LABOR AND ITS SIGNIFICANCE IN HEART DISEASE

MAJOR JOHN J. SAMPSON, M.C., A.U.S., ELISE M. ROSE, M.D., AND ROBERT QUINN, LIEUTENANT (S.G.) (MC), USNR, SAN FRANCISCO, CALIF.

(From the Departments of Medicine and Obstetrics, University of California)

IT MAY be assumed that both pregnancy and labor are accompanied by increased cardiac effort. The degree of this increment varies widely in different cases, either with or without complications. It is the purpose of this paper to present an estimate of the amount and character of physical effort during labor, especially as it induces increased cardiac work. There is considerable difference of opinion as to the magnitude of the work involved in labor, especially regarding the possibility of precipitating heart failure in cardiac patients.

It is recognized by many clinicians that a cardiac patient in Class II or Class III (moderate or severe heart failure, American Heart Association Classification) is likely to have prolonged or permanent reduction of her cardiac reserve after a single episode of excessive physical work. With voluntary effort, the protective mechanism, as dyspnea, will generally force the patient to stop such effort prior to precipitation of serious heart failure. In labor much of the work done is involuntary and, therefore, not subject to control even though protective and warning signs and symptoms develop. It would, therefore, seem reasonable to protect such patients against excessive loads of work by early termination of pregnancy, or cesarean section if it could be shown that the work was of the magnitude commonly recognized as capable of producing serious heart failure, or permanent reduction of cardiac reserve. Although Boyer & Nadas[1] recently showed that life expectancy was not shortened by pregnancies, in a statistical survey of one hundred and three cardiac patients, experience with individual cases, such as Case 41 in this series, suggests reduction of cardiac function may follow obstetric labor.

NOTE: The Editors accept no responsibility for the views and statements of authors as published in their "Original Communications."

Although one cannot with certainty predict that a Class I or mild Class II patient may not develop more serious failure late in pregnancy, the attendance of clinicians in obstetric clinics to evaluate for the obstetrician the gravity of heart disease in pregnant women, has resulted in a lowered fatality of cardiac cases. The skillful care given to patients bordering on failure is as much responsible for this lowered fatality rate as the early interruption of pregnancy in women who were poor obstetric risks.

Thus, with the establishment of cardiac obstetric clinics, many hospitals have reported no cardiac obstetric fatalities for several years. However, it is recognized that an irreducible minimum of cardiac deaths may occur. This has been given by Hamilton and Thomson[2] as 2.5 per cent and constitutes the following complications: Embolism, bacterial endocarditis, sepsis, and hemorrhage. Of these, bacterial endocarditis is the only true cardiac complication, and it constitutes only 0.75 per cent of cardiac deaths during pregnancy. Hamilton has rather arbitrarily divided his series of cases which total 894 into a favorable and unfavorable group. Those in the unfavorable group have had signs or history of heart failure, auricular fibrillation, or have had serious complicating diseases. The mortality is 16 per cent for his series of unfavorable patients. He gives a mortality of 33⅓ per cent for patients with auricular fibrillation. In the favorable group, Hamilton and Thomson have reported over 320 consecutive cases, during one period of their study, without loss of a patient from congestive heart failure.

TABLE I. OBSTETRICAL CARDIAC CASES OBSERVED—MAY, 1936 THROUGH OCTOBER, 1942, UNIVERSITY OF CALIFORNIA HOSPITAL

TOTAL CLINIC DELIVERIES—3,180		ORGANIC HEART DISEASE*—80	
PERCENTAGE CARDIAC—2.5			
NO MATERNAL OR TERM FETAL DEATHS IN CARDIAC CASES			
ETIOLOGY AND TYPES OF LESIONS			
Rheumatic—57		*Congenital*—14	
Mitral insufficiency	20	I-V Septal Defect (1 Compl. A-V Block)	6
Mitral insufficiency and stenosis	32	Aortic coarctation	2
Aortic insufficiency, mitral insufficiency and stenosis	5	Subaortic stenosis	1
Doubtful Rheumatic		Patent ductus arteriosus	2
Mitral insufficiency	3	Pulmonary stenosis (1 Tetral. of Fallot)	3
Thyrotoxic	4	*Hypertensive-Coronary Arteriosclerosis*	1
		Beriberi	1
ARRHYTHMIAS			
Ectopic beats	4	Complete A-V heart block	1
Paroxysmal tachycardia	7	Auricular fibrillation	2
COMPLICATIONS			
Bronchitis and pneumonia	3	Acute rheumatic fever	1
Pulmonary infarct	2	Subacute bacterial endocarditis (Mother lived 5 months post partum) Normal child	1
CLASS OF CARDIAC FUNCTION			
I—17	II(IIa)—46	III(IIb)—15	IV—0 Unclassified—2
MODE OF DELIVERY			
Abortions, miscarriages, hysterotomies	5 (3 group III)	Midforceps	1 (group III)
		Cesarean cardiac indication	3 (group III)
Spontaneous	39 (5 group III)	Cesarean obstetric indication	11
Low forceps	18 (3 group III)	Undelivered as of October 15, 1942	4

*This includes 2 successive deliveries on each of 5 patients.

At the University of California Hospital, there have been 90 cardiac obstetric patients cared for within the six years of 1936 through 1942, without death from any cause. The diagnostic classification (American Heart Association Classification), complications, and mode of delivery of 89 per cent of these patients are given in Table I. Undoubtedly, there will be fatalities from one or another of the "irreducible minimum" causes of fatality as future cases are added to the series.

It is a belief, well substantiated statistically, that rheumatic heart disease patients tolerate surgery well and, therefore, should tolerate cesarean section. The death of approximately 50 per cent of all cardiac obstetric fatalities occurs within the first forty-eight hours after delivery according to Hoffman and Jeffers[3] including the cesarean sections. It is assumed that certain changes occur in the maternal circulation after delivery which may precipitate heart failure, and investigation of these changes is now being undertaken by the personnel at the University of California Obstetrical Cardiac Clinic. Even if some of these postpartum changes occur after cesarean section, such mode of delivery may be indicated, if it can be shown that the work of labor may be of significant magnitude and that in any particular case, it may be unpredictable. The operative and postoperative risk of this procedure must naturally be weighed against such prospective reduction of the cardiac hazard.

There have been reported recently, certain circulatory changes which may place an increasing burden on the heart as pregnancy advances. These changes have led to the conclusion by Hamilton and Thomson,[4] that if a patient be carried through the eighth lunar month, she should then be permitted to complete her term of pregnancy. Failure is less likely to occur in the ninth and tenth months than in the eighth month according to Cohen and Thomson.[5] Cohen and Thomson[5] (Fig.1) and Burwell[6] are largely responsible for the following information: There is an increase of (1) blood volume to a maximum of about 45 per cent; (2) of cardiac output to a maximum of about 50 per cent; (3) of the oxygen consumption or metabolic rate to a maximum of 15 to 20 per cent; and (4) there is a decrease of the arteriovenous oxygen difference, presumably due to shunting through the placenta. Although, as stated, these changes start about the fifth month and reach their peak at 8½ months, the presumed increments of unavoidable work are still elevated at term, and therefore, are a burden added to that of labor.

Hamilton and Thomson[2] report a maternal mortality of 8.3 per cent on cesarean section cases as against 2 per cent by pelvic delivery, with 5 per cent mortality from heart failure in the former group, and 7 per cent in the latter group. They make no comment on the degree of heart failure in the patients selected for cesarean section, but the high fatality rate in this group may have been due to the selection of patients with more serious heart failure.

Harrison[7] has shown that cardiac patients develop greater oxygen debts than normal individuals only ofter extreme physical effort that approaches their maximum capacity. Dyspnea ordinarily checks the amount of work done, but it can be readily seen that with obstestric labor this work undertaken is often impossible to control, and may seriously tax the limited circulatory capacity of a cardiac patient. Dyspnea here can be no check and the result may be serious. The

capacity to supply oxygen to the tissues is limited. It may approach twenty times the basal metabolic rate in an athlete, and it is known that training improves the coefficient of utilization of oxygen and throws less work on the heart. In cardiac patients, the coefficient of utilization or the amount of oxygen taken up per unit of blood may be normal, but their training is generally poor and therefore, we would expect this factor to be low.

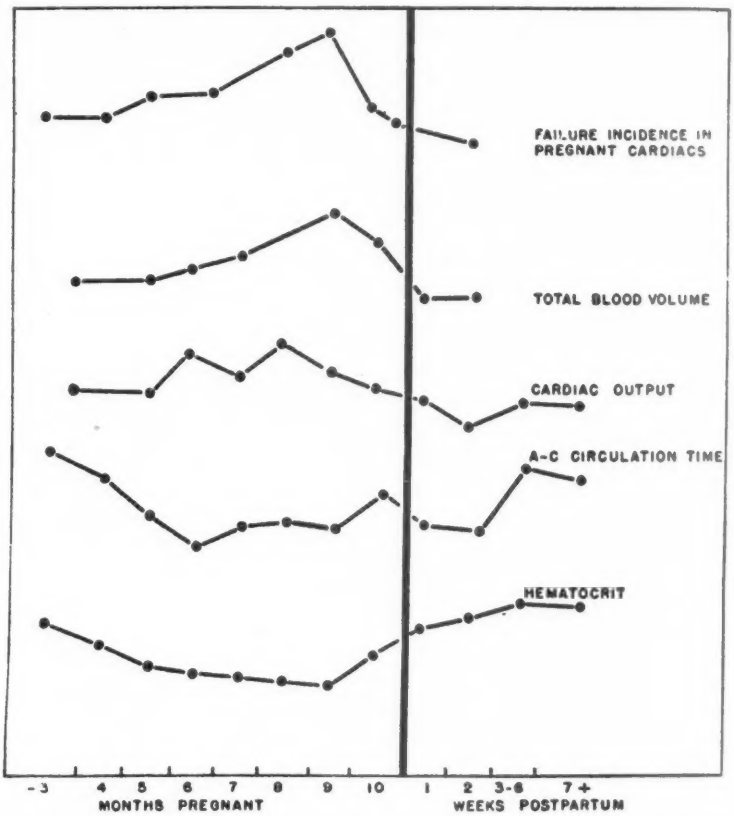


Fig. 1.—Circulatory burden on the heart in pregnancy. (*From Cohen and Thomson, J. A. M. A.* **112**: *116, 1939.*)

There has been recently an effort to measure the amount of work during the first stage of labor by Woodbury, Hamilton and Torpin.[8] By the use of manometers connected to the brachial artery, the duodenum, and the fundus of the uterus they estimated the differential pressures in the abdomen, in the uterus, and in the maternal placental blood vessels. They estimated that 25 to 95 mm. Hg pressure was present in the uterus with each pain, and that a maximum of 500 grams pressure per square cm. cross section of the uterine wall occurred. Their most interesting conclusion was that the bearing down forces of the abdominal and chest muscles were not expulsive before cervical dilatation, but materially diminished the maternal placental blood pressure even to the zero point. These forces, however, were effective in expulsion of the fetus after cervical dilatation. Such anesthetics and hypnotics as morphine sulfate, barbiturates, nitrous oxide and oxygen, and cyclopropane diminished these extrauterine forces and actually increased the maternal placental arterial blood pressure. Epinephrine likewise, increased that blood pressure and as such, diminished the chances of fetal anoxia.

In 1936, Stahler[9] published an article entitled "The Physiology of Work in Pregnancy." Although this paper included a section describing the changes in character, rate and depth of respiration during

labor, and a section on the physiology of work during pregnancy, the section of chief interest to us was that on the measurement of work in labor. He measured the oxygen consumption and carbon-dioxide output for a short period in the first or early stage of labor, during the expulsive period, and in the immediate postpartum period. His estimation of the gas exchange for the entire period of labor was based on a summation of the single observations made during each of three or four stages, and assumed that this represented the average figures for the whole individual stage studied. He then converted his increment in gaseous exchange into calories, and estimated that the work of delivery varied from 166 to 1,555 calories. He estimated that the work of an average 16-hour primiparous delivery was the equivalent of two hours' heavy work of a stonemason or woodcutter. The patient with the greatest energy consumption was estimated to have done the work equivalent to a 30-kilometer march on the level. The average caloric expenditure was 42 calories per hour, and the maximum 56 calories per hour during the pushing efforts. Lusk[10] estimated the calories of work at 214 per hour for a laundress at work, and 378 per hour for a man sawing wood.

We have found that such spot determinations in the three or four phases of labor made by Stahler[9] do not give an accurate picture of the total oxygen consumption or the periodic character of the work undertaken. Whereas, as will be shown, our estimates of total work done in labor are of the same order as those of Stahler,[9] different conclusions will be placed on the magnitude of cardiac strain or demands involved. Likewise, we have observed great variation in respiratory rate and depth with the voluntary and involuntary work. Another observation on the respiration in our cases was that after a period of hyperpnea, there was a leveling off of the curve of oxygen consumption. This was probably due to absorption of the increased alveolar oxygen content and was succeeded by a uniform progress of the line of oxygen uptake.

Technique

Forty-two patients were studied during obstetric labor. Three cases were excluded from the tabulation (Table II) because the recordings were insufficient to draw any satisfactory conclusions. On ten cases oxygen intake was measured in selected periods of over six minutes each at various times during the first three stages of labor, and through the first two hours of the postpartum period. In 29 cases only the postpartum oxygen consumption was measured. The ordinary Roth-Benedict type of metabolism apparatus was used with the standard rubber mouthpiece. The oxygen utilization as well as the depth and rate of respiration were recorded on the kymograph.

The measurement of oxygen utilized was accomplished by plotting graphically the oxygen consumption in cubic centimeters per minute for each determination and connecting by line the midpoint of each determination to form an angular graph. The area under the curve obtained by connecting these points using the basal metabolic rate as the base line was then obtained by use of a planimeter. Technical differences in obtaining determinations on patients during labor with struggling, vomiting, fatigue, or short periods of gas anesthesia interfered with certain of the tests made, but generally satisfactory curves could be obtained.

In certain cases continuous readings were obtained during the entire postpartum period. Since the plotted graphs of continuous oxygen uptake did not materially differ from those in which the patient was allowed short rest periods of 1 to 10 minutes breathing atmospheric

TABLE II. DURATION OF EXCESS OXYGEN CONSUMPTION AFTER DELIVERY IN 39 PATIENTS

Primipara: (15 Uncomplicated)
2—Oxygen consumption returned to basal level within ½ to ¾ hour after delivery
2—Oxygen consumption returned to basal level within ¾ to 1 hour after delivery
11—Oxygen consumption did not return to basal level until after 1 hour after delivery (6 showed "oxygen debt" at conclusion of observation period)
Multipara: (16 Uncomplicated)
1—Oxygen consumption returned to basal level under ½ hour after delivery
2—Oxygen consumption returned to basal level within ½ to ¾ hour after delivery
5—Oxygen consumption returned to basal level within ¾ to 1 hour after delivery
8—Oxygen consumption did not return to basal level until after I hour after delivery (4 showed appreciable "oxygen debt" at conclusion of observation period)
5 Rheumatic Heart Disease Cases:
2 Cases—Class II
Both were multipara and oxygen consumption returned to basal levels under 1 hour
3 Cases—Class III
1—(Primipara). Delivered by cesarean section—first stage—oxygen consumption returned to basal level immediately after delivery
1—(Multipara). 18% excess oxygen consumption at 1½ hours after delivery
1—(Primipara). 20% excess oxygen consumption at 2 hours and 25% excess oxygen consumption at 2 days after delivery
3 Cases: (Complicated)
Case 17: (Multipara)—57% excess oxygen consumption in 1 hour 10 minutes after delivery. Large baby—moderate dystocia
Case 18: (Multipara)—Thyrotoxic—oxygen consumption excess and increasing 1 hour after delivery, over basal figures determined 2 weeks post partum
Case 42: (Multipara)—Breech presentation—37% oxygen consumption excess over basal level 2 hours after delivery

air, it was assumed that little difference was made in estimation of total oxygen absorption by such breaks in the curve. Therefore, all later curves were made in broken periods. Gagge[11] has used this technique effectively in measuring similar periods of oxygen consumption.

Although it is not entirely essential in these case studies, for the purpose of comparison with common daily forms of physical work the oxygen consumed can be approximately translated into terms of kilogram-meters of work or calories of heat produced. Assuming basal fasting conditions, Shock's [12] ratios of 2 c.c. to 4 c.c. 0_2 consumed per kilogram-meters of work and Lusk's[13] ratios 4.825 of calories per liter of oxygen have been used in Table III.

It is impossible to translate exactly the amount of oxygen utilized into kilogram-meters of work for the following reasons:

1. As has been shown by Shock[12] and others, the efficiency of work done varies inversly with the rate at which it is performed. Thus, in stair climbing measurements on adolescent girls, Shock[12] found that in their climbing 4± cubic centimeters of oxygen were utilized to each kilogram-meter of work when that work was done within two minutes; whereas, only 2± cubic centimeters of oxygen were used when that work was accomplished in over 3½ minutes.

2. The development of an oxygen debt, as shown by Margaria and Edwards,[14] is dependent not only on the excess oxygen needed for the increased muscular work, but also approximately one-third of the total oxygen debt developed is due to an increase of the general tissue metabolism over the resting level, probably due to thyroid or other endocrine stimulation.

3. It is recognized by Hill and Flack,[15] and others that breathing oxygen improves the efficiency of the circulation during work, and likewise that there is probably some reduction in the amount of oxygen debt accumulated during work when oxygen is inhaled.

Results

The duration of significantly increased oxygen consumption over basal levels in 39 cases is given in Table II. Although persistent in-

TABLE III

CASE NO.	AGE	PRIMIPARA MULTIPARA	CL. DIAGNOSIS FUNCT. CLASS.	TYPE DE-LIVERY	DURATION FIRST STAGE	DURATION SECOND STAGE	CHAR. PAINS SECOND STAGE	POST DELIVERY MEDICATION	EPISI-OT-OMY
39 K	22	Primipara	Nervous Tension Hyperventilation	Low Forceps ROA	16 hours 10 minutes	95 minutes	Poor—Fair No expul-sions Pains	Baserg. 1 c.c. Neogyn. 2 tab. Ergot. 1 c.c.	Yes
40 P	28	Primipara	Mitral stenosis and Insufficiency Auricular fibrila-lation Class IV	Low Forceps LOA	4 hours	39 minutes	Fair	Baserg. 1 c.c. Neogyn. 2 tab. Ergot. 1 c.c.	Yes
41 W	32	Multipara Para vi	Normal	Spont. ROA OA	4 hours 45 minutes	13 minutes	Fair to Good	Baserg. 1 c.c. Neogyn. 2 tab. Ergot. 1 c.c. + 1 c.c. pit.	Yes
42 R	22	Multipara Para ii	Normal	Breech Spont.	15 hours 32 minutes	20 minutes	Fair to Good	Baserg. 1 c.c. Neogyn. 2 tab. Ergot. 1 c.c.	Yes
43 V	38	Multipara Para viii	Mitral stenosis and Insufficiency Hyperventilation Class II-III	LOA Spont.	2 hours 40 minutes	17 minutes	Poor at first Good last ½ hour	Baserg. 1 c.c. Neogyn. 2 tab. Ergot. 1 c.c. Cod. and Aspirin	No
44 A	34	Multipara Para iv	Normal	LOA Spont.	6 hours 10 minutes	5 minutes	Rapid 2nd Stage Forceful	Baserg. 1 c.c. Neogyn. 2 tab. Ergot. 1 c.c.	No

(Continued on next page)

TABLE III.—CONT'D

TOTAL ESTIMATED OXYGEN INTAKE OVER BASAL CONSUMPTION	WORK ESTIMATED IN KG./M.	WORK ESTIMATED IN CALORIES	OXYGEN CONSUMPTION RETURNED TO APPROXIMATE BASAL LEVELS UNDER 1 HOUR	OVER 1 HOUR	% OVER AVERAGE BASAL AT TIME OF LAST DETERMINATION
60,560 c.c.	15,140 minimum 30,280 maximum	297		+	0 1 hour 5 minutes
34,650 c.c.	8,662 minimum 17,325 maximum	167		+	25% + on 2nd day
20,400 c.c.	5,100 minimum 10,200 maximum	98.43	+		0 1 hour 9 minutes
55,290 c.c.	13,822 minimum 27,645 maximum	266		+	37%—2 hours
23,720 c.c.	5,930 minimum 11,860 maximum	114		+	18.7% 1 hour 34 minutes
20,304 c.c.	5,085 minimum 10,170 maximum	100–	+		0

Note: Using the ratio of 0.4268 Kg./M. to 1 calory and estimating that approximately 25% of the heat production represents work, the resultant figures for Kg./meters approximates very closely the maximum conversion ratio furnished by Shock[12], namely, 2 c.c. ± oxygen consumption represents 1 Kg./M. of work as given in this table.

crease of metabolic demands could account for the excess oxygen consumption, the relatively rapid return to normal suggests that the excess oxygen intake represents repayment of oxygen debt incurred by the work of labor. The delayed return to basal levels probably represents a greater debt or faulty cardiorespiratory mechanisms.

In an analysis of the fifteen uncomplicated primiparas studied, it will be seen that eleven (73 per cent) did not dispose of their oxygen debt until after 1 hour, in contrast to eight (50 per cent) of the sixteen uncomplicated multiparas.

Basal oxygen consumption determined 2 to 14 days before labor differed from that determined on the fifth to the twentieth day after labor, by rates varying from 20 per cent lower to approximately the same rate. The majority of cases showed about 10 per cent lower basal oxygen consumption after delivery than before labor. It has not been determined when this postpartum fall in metabolic rate occurs. Likewise, the cause of elevated rate in pregnancy is not known although probably accounted for in part by the fetal metabolism. Several patients fell to a subbasal level at 1 to 2 hour post partum, especially when fatigued and sedated, and some of these patients actually fell asleep while the postpartum oxygen determination was being made.

Since it was impossible to predict the patient, who temperamentally would prove a suitable subject for study, and since the differences of antepartum and postpartum basal metabolic rates as measured on the first twenty-nine cases were so little, only postpartum basal oxygen consumption was measured in the last 13 cases. In only one instance was an abnormally high metabolic rate obtained; this in a woman with a mild hyperthyroidism due to administration of 1 gr. of thyroid extract (Armour) per day, during her entire pregnancy. The results of the oxygen studies in this patient were not possible to evaluate as thyroid substance was not administered post partum and therefore, the increment of oxygen consumption during labor could not be compared to the estimated basal rate at that time. None of the group was fed during labor. In the six patients with the most complete observations through all stages of labor (Table III), the specific dynamic action of food may probably be disregarded since none had been fed for about five hours before the second stage of labor. Therefore, the metabolic rate would probably not be elevated from this source over 5 to 10 per cent of the recorded basal oxygen consumption during the later stages of labor.

The characteristic curve, especially in the postpartum period of the uncomplicated primiparous patient is illustrated in Fig. 2, Case 39. This curve does not show studies immediately before delivery, and commonly in primipara, there was moderately but not greatly elevated oxygen consumption at this time. Immediately following delivery, there is generally a flattened curve with the return to basal levels delayed longer than in the multiparous patients. A similar curve of postpartum period is seen in Fig. 3, Case 25. The antepartum oxygen determinations illustrate the fluctuation that often occurs—increasing

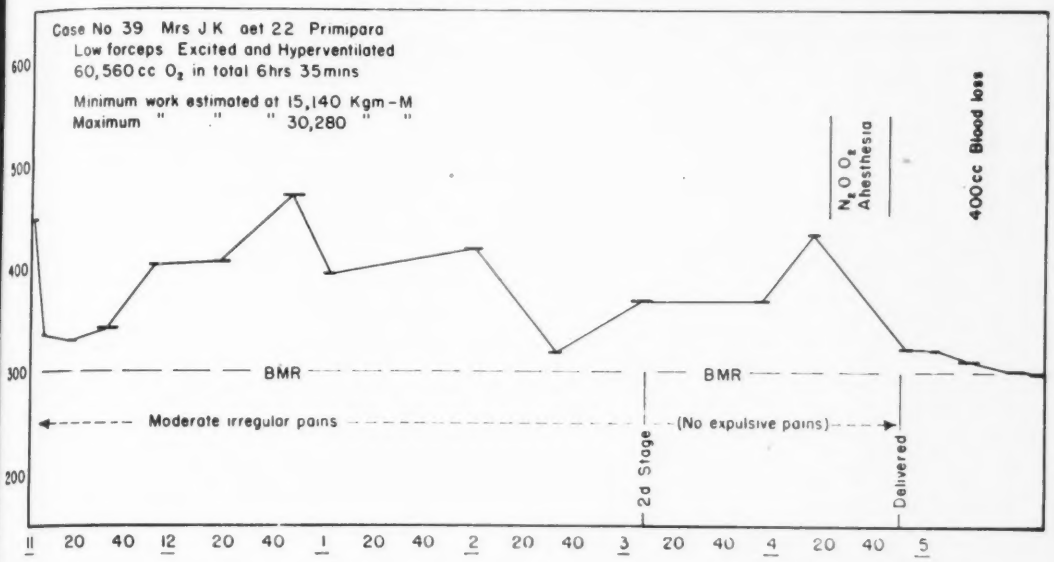


Fig. 2.—Numbers at side denote oxygen consumed per minute-cubic centimeters, at bottom the time. This applies also to Figs. 3 to 8.

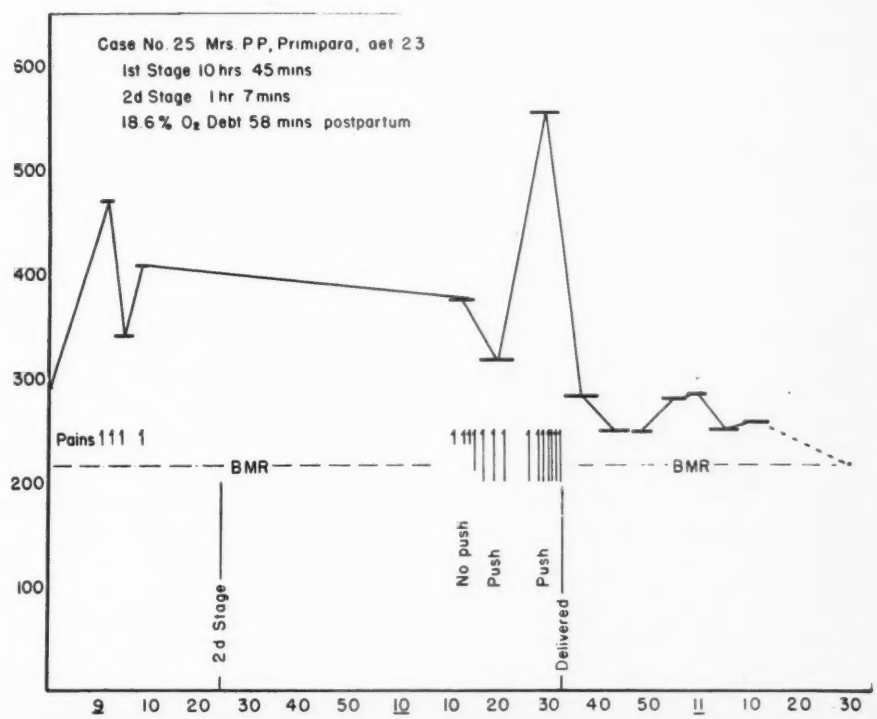


Fig. 3.—Numbers at side denote oxygen consumed per minute-cubic centimeters, at bottom the time.

with periods of actual pains and returning to near basal levels when quiet (Case 39). The first oxygen determinations in this patient (Case 39) may be disregarded, having been made shortly after walking into the hospital. This was an excitable, restless patient, and some of the early fluctuations may have been exaggerated by muscular activity. She used little voluntary effort, and low forceps were applied for delivery.

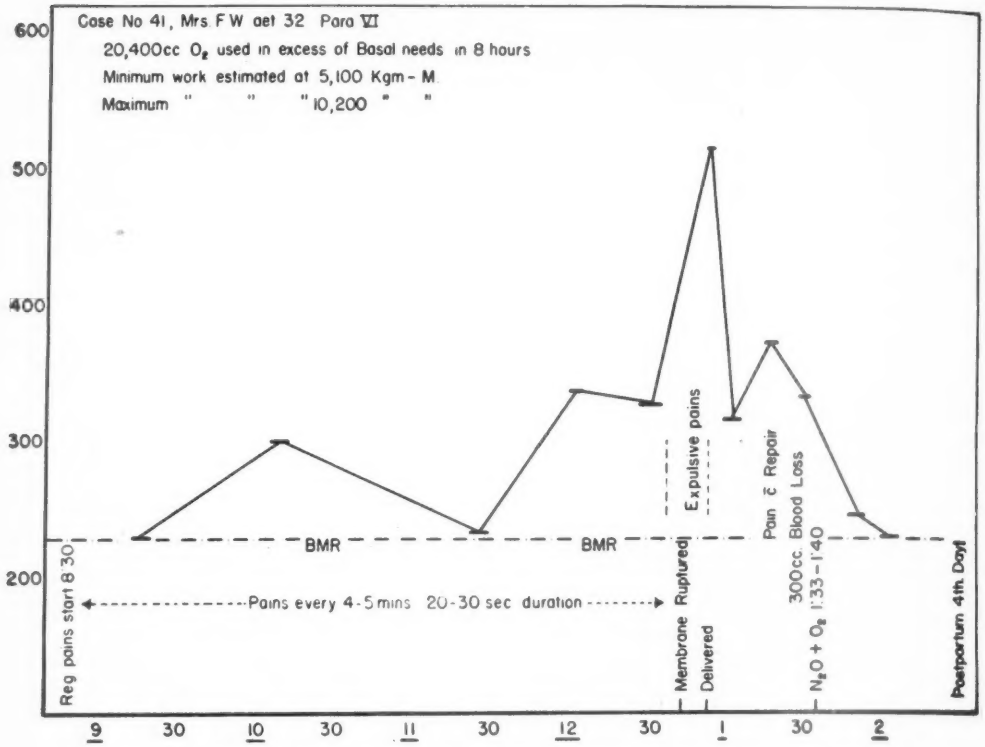

Case No 41, Mrs F W aet 32 Para VI
20,400cc O_2 used in excess of Basal needs in 8 hours
Minimum work estimated at 5,100 Kgm - M
Maximum " " " 10,200 " "
600
500
400
300
200
BMR
BMR
Expulsive pains
Pain & Repair
300cc. Blood Loss
$N_2O + O_2$ 1:33 - 1:40
Reg pains start 8 30
Pains every 4-5 mins 20-30 sec duration
Membrane Ruptured
Delivered
Postpartum 4th Day!
9 30 10 30 11 30 12 30 1 30 2

Fig. 4.—Numbers at side denote oxygen consumed per minute-cubic centimeters, at bottom the time.

The most characteristic curve of multiparous patients is illustrated in Fig. 4, Case 41. There is a relatively late, steep rise of the curve, often 100 per cent to 400 per cent of the basal level. There is then a rapid drop with a secondary rise and a prompt return to basal levels. The initial fall of oxygen consumption immediately after delivery may be due to overventilation. This type of curve in many multiparous patients resembles the character of curves obtained in normal human beings after any sudden violent effort such as running. Fig. 5, Case 43, illustrates a high and abrupt rise of oxygen consumption that occasionally occurs as an exaggerated form of the previous curve probably resulting from a psychic tachypnea, although this patient had asymptomatic mitral valvulitis. Likewise, Case 42, Fig. 6, a breech presentation, serves to illustrate that form.

In the patients with rheumatic heart disease, there were five cases, all with mitral stenosis and insufficiency (Table II). Two classified as Group III were multiparous, and returned to their basal rate under one hour, illustrating the benign type of cardiac patient who does not require special obstetric procedure.

All of the three cases grouped in Class III, had shown various degrees of heart failure during pregnancy.

Case 43, Fig. 5, was a multipara who had developed marked dyspnea on effort in the last three weeks of her pregnancy. She showed evidence of failure during expulsive pains immediately preceding delivery. Her respiratory rate was maintained at 45 per minute for approxi-

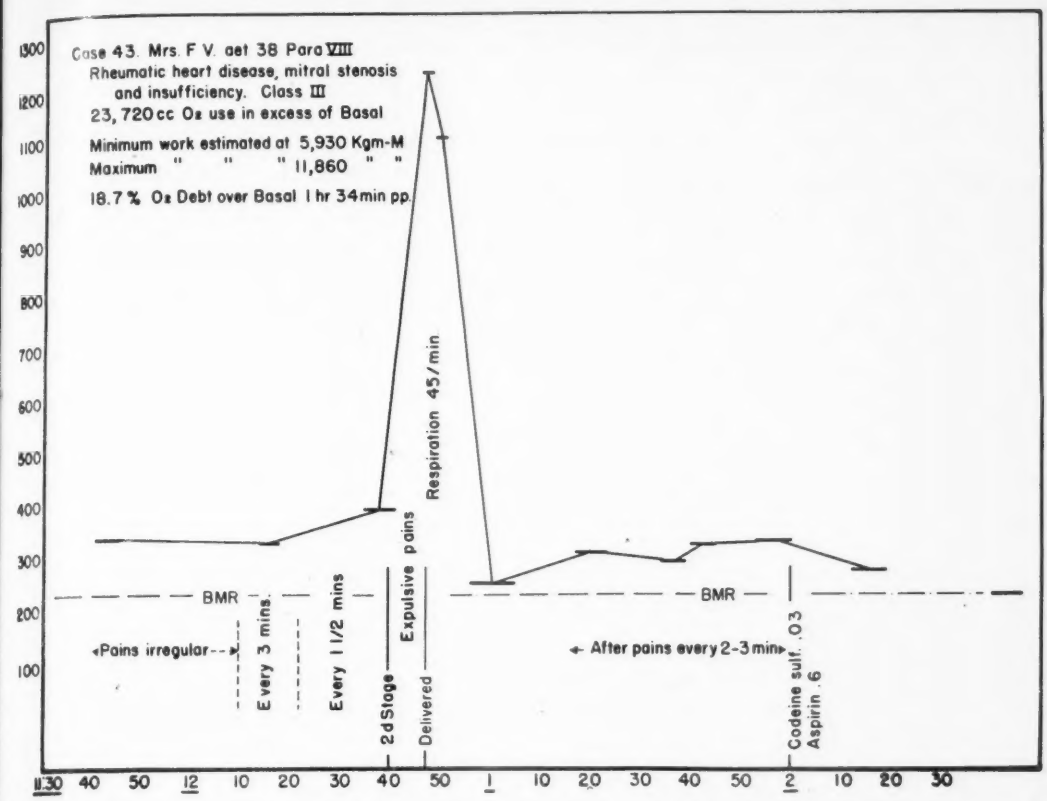


Fig. 5.—Numbers at side denote oxygen consumed per minute-cubic centimeters, at bottom the time.

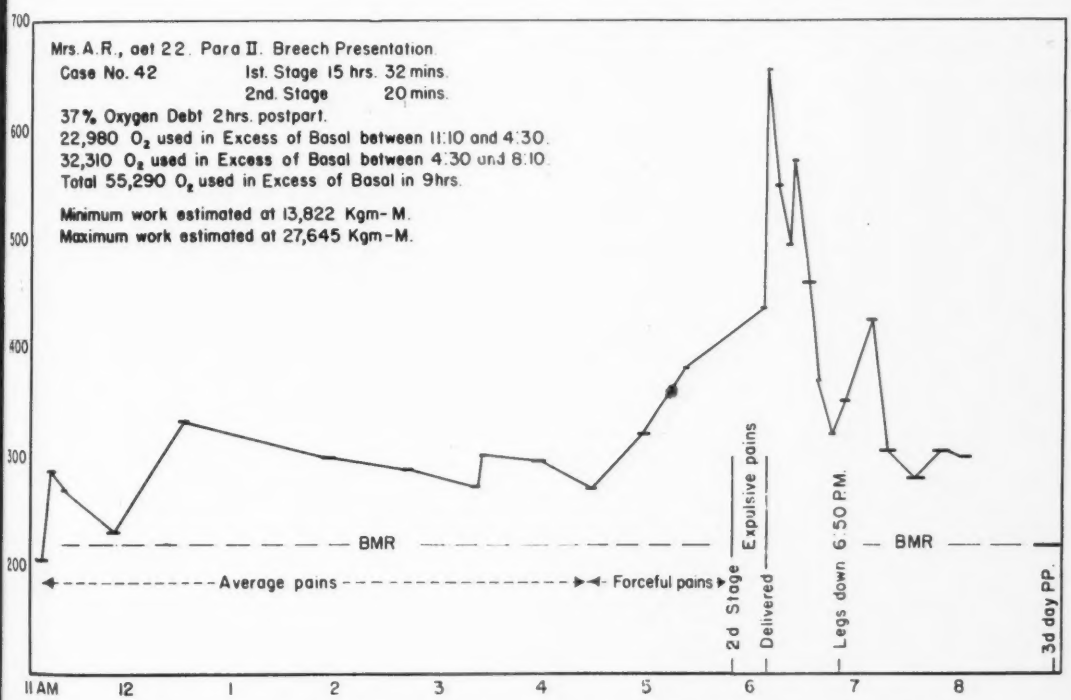

Mrs. A.R., aet 22. Para II. Breech Presentation.
Case No. 42 1st. Stage 15 hrs. 32 mins.
2nd. Stage 20 mins.
37% Oxygen Debt 2 hrs. postpart.
22,980 O₂ used in Excess of Basal between 11:10 and 4:30.
32,310 O₂ used in Excess of Basal between 4:30 and 8:10.
Total 55,290 O₂ used in Excess of Basal in 9 hrs.
Minimum work estimated at 13,822 Kgm-M.
Maximum work estimated at 27,645 Kgm-M.
BMR
Average pains
Forceful pains
2d Stage
Expulsive pains
Delivered
Legs down 6:50 P.M.
3d day PP.
700
600
500
400
300
200
11 AM 12 1 2 3 4 5 6 7 8

Fig. 6.—Numbers at side denote oxygen consumed per minute-cubic centimeters, at bottom the time.

mately 15 minutes, and there was a tremendous increment of oxygen utilization. She showed an 18 per cent "oxygen debt" 1½ hours after delivery, but there was an abrupt return to low levels of oxygen intake after the period of high consumption. She presented no signs of heart failure after delivery.

Case 24, Fig. 7, was a 30-year-old woman in her second pregnancy, the first having terminated in a spontaneous abortion in the fourth month. She had increasing signs of congestive heart failure and a

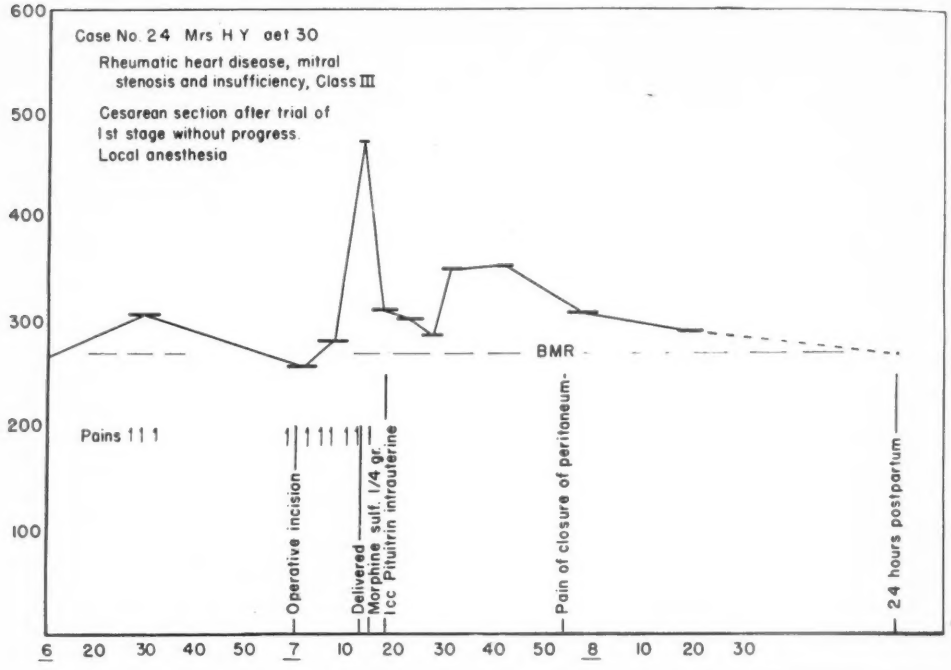


Fig. 7.—Numbers at side denote oxygen consumed per minute-cubic centimeters, at bottom the time.

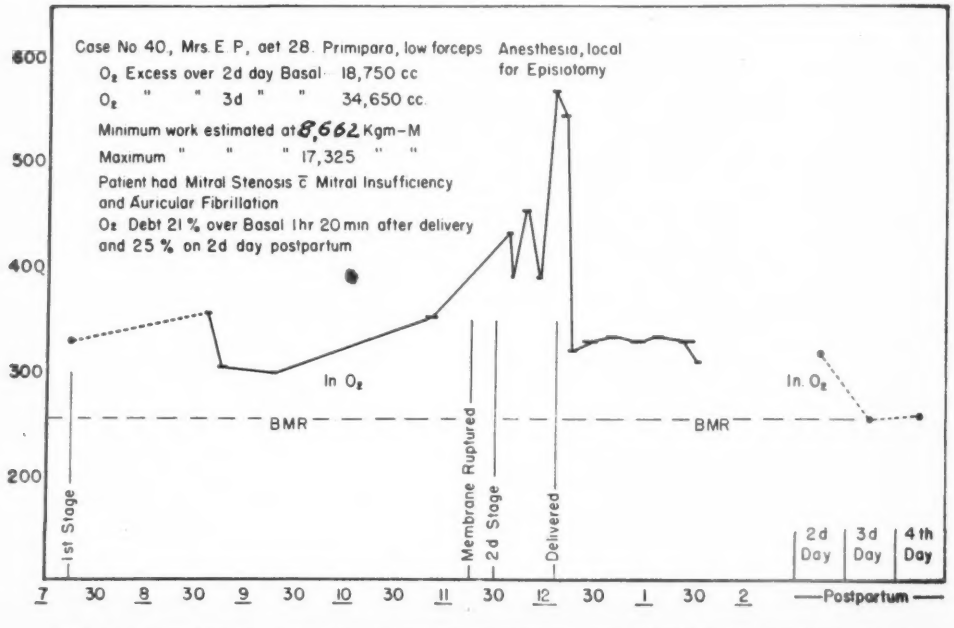

Case No 40, Mrs. E. P, aet 28. Primipara, low forceps
Anesthesia, local for Episiotomy
O₂ Excess over 2d day Basal 18,750 cc
O₂ " " 3d " " 34,650 cc
Minimum work estimated at 8,662 Kgm-M
Maximum " " " 17,325 " "
Patient had Mitral Stenosis & Mitral Insufficiency and Auricular Fibrillation
O₂ Debt 21 % over Basal 1hr 20 min after delivery and 25 % on 2d day postpartum
600
500
400
300
200
ln O₂
ln. O₂
BMR
BMR
1st Stage
Membrane Ruptured
2d Stage
Delivered
2d Day
3d Day
4th Day
7 30 8 30 9 30 10 30 11 30 12 30 1 30 2
Postpartum

Fig. 8.—Numbers at side denote oxygen consumed per minute-cubic centimeters, at bottom the time.

cesarean section was accomplished at term with uneventful recovery. Fig. 7 is a graphic record of the oxygen consumption determined through the operation. She was having mild first-stage labor pains at the time, having made no progress with labor in thirteen hours. With exception of the transient rise during manipulation of the uterus and the somewhat more prolonged rise after intrauterine pituitrin, there was little excess oxygen utilized. An increased oxygen consumption following pituitrin administration intramuscularly was observed in this as in many of the patients delivered vaginally.

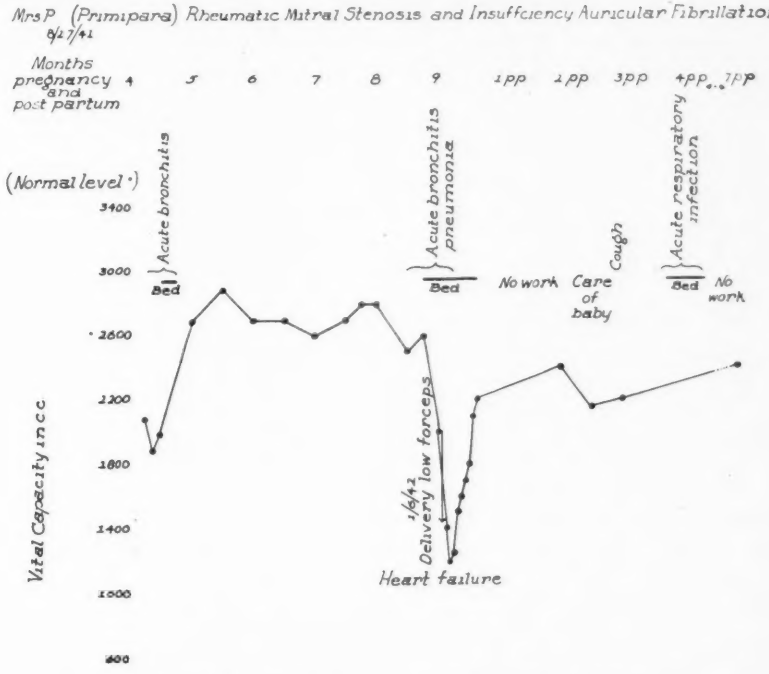


Fig. 9.—Vital capacity in complicated cardiac pregnancy.

Case 40, Fig. 8, was that of a primiparous woman, aged 28 years, with mitral stenosis and insufficiency, auricular fibrillation with moderate congestive heart failure and under constant digitalis therapy. Succeeding an attack of acute bronchitis in the fourth month of pregnancy, she was confined to rest at home. During the ninth month of pregnancy, her dyspnea increased and she was hospitalized, and developed another acute respiratory tract infection at term. Elevated venous pressure and pulmonary râles developed in the last two hours of labor and she was given oxygen continuously, not only for measurement of her oxygen intake, but also for the therapeutic effect. The forceful labor pains lasted about 2 hours, 40 minutes of which were occupied with severe expulsive contractions. She was discouraged from voluntary effort.

The oxygen consumption fell rapidly after delivery by low forceps, but remained constantly elevated at between 20 and 25 per cent above the basal level for the succeeding hour and a half, and through the next 36 hours. An isolated determination 1½ hours after delivery showed a marked elevation following excitement. This patient's vital capacity changes are shown in Fig. 9, and illustrate the rapid fall with the respiratory tract infection and the recovery which covers a period of about four weeks. At no time had the vital capacity recovered the antepartum level in the next seven months, which indicates that the functional damage to the heart following the pregnancy, labor, and respiratory tract infection was probably permanent.

Three cases of complicated labor were studied, all multiparous.

Case 17 had a long difficult labor with a large baby, and showed a 5 per cent "oxygen debt" one hour, ten minutes post partum.

Case 18, a thyrotoxicosis, showed a continuous rising curve of oxygen utilization for one hour after delivery, and probably illustrates the effect of labor in increasing the basal metabolic rate.

When any complication in labor develops which interferes with prompt delivery or increases the work of delivery, even in multiparous women, the oxygen consumption curve reflects the degree and often the pattern of the time distribution of this work. This is illustrated in Fig. 6, Case 42, of a multiparous woman with a breech presentation. In this patient, there was a slightly greater oxygen intake through the early first stage and a progressive increase with the onset of forceful pains prior to, and through complete cervical dilatation.

There is no indication that the work pattern follows the arbitrary division into first and second stages of labor. The peak immediately after delivery was followed by a prompt drop and a secondary rise, as was often found in our series of cases. There was then a delay in the return to the basal levels suggesting a persistent oxygen debt and, therefore, a load of work not readily compensated for by the normal respiratory and circulatory mechanisms of this woman. The graphic illustration of this type of response serves to show that even a multiparous woman may have a high work increment during labor.

In addition to these three cases, two of the primiparous cases presented slow returns to the basal level having relatively prolonged and more severe labors with "occiput posterior" presentations.

In the six instances of forcep applications in our series, no undue oxygen demand was evidenced.

The use of chest and abdominal muscles in forceful and voluntary pushing resulted in an abrupt increase of the oxygen intake as illustrated in Fig. 3, Case 25. This may represent a possible danger to the cardiac patients, and proposes the question as to whether this type of effort, either voluntary or involuntary, will cause more harm to the patient than the prolongation of a less strenuous labor as by use of anesthesia.

The estimates of oxygen consumption in these 6 cases studied through all stages of labor varied from 20,400 c.c. in an uncompleted multiparous patient with 4¾ hours of first stage, and 13 minutes second stage of labor to 60,560 c.c. in a primipara with approximately 16 hours of first stage, and 1 hour second stage. Using the basal factor of conversion ratio of 4.825 Cal. per liter of oxygen, these figures are somewhat less than Stahler's figures, namely, 96.5 to 292 Cal. as contrasted to 166 to 1,555. This difference is probably due to Stahler's estimation of the entire metabolic rate of each period of labor from the single determination of O_2 and CO_2 made during that period. From our records, it is believed that this is an inaccurate means of estimation, since wide and abrupt fluctuations occur in O_2 consumption in all phases of labor. Other obstetric details of these cases are recorded in Table III. Blood pressure and pulse rate observations were made at various times through labor, but no conclusion could be reached on their significance.

The practical significance of these estimates is that the total work done may be unimportant if accomplished over a longer period of time as illustrated in Case 39, Fig. 2, where there was a total excess intake of 60,560 c.c. of O_2 but an average of only 59 c.c. per minute, or about 20 per cent over basal rates. This represents no more than the lightest physical exercise.

On the contrary, the sudden load of work as accomplished between 4:30 P.M. and 6:10 P.M. in Case 42, Fig. 6, is represented by the approximate figure of 32,310 c.c. of excess oxygen consumed after 4:30

P.M. This is an average consumption of 150 per cent of the basal needs and represents between 8,092 and 16,155 Kg.-meters of physical work, or the work accomplished by a 50 Kg. individual climbing 161.4 to 322.8 meters, or from 40 to 80 flights of stairs.

Work is in progress at the University of California Hospital on blood volume, hematocrit, vital capacity, water balance, and circulation rate as well as blood pressure and pulse rate immediately prior to and succeeding delivery. A portion of this work has been reported in a preliminary publication[16] and may give further clues to the mechanisms of circulatory strains and adjustments in labor.

Conclusions

1. A simple method is presented for the estimation of the degree and the time distribution of the work of obstetric labor by measurement of the oxygen consumption of the patient. Thirty-nine cases were studied.

2. In primiparous patients, the conclusion was drawn that a greater amount of work was done in a longer period of time than in multiparous patients as would be expected. Generally, in the first stage of labor, periods of increased oxygen consumption alternated with basal rates probably representing payment of oxygen debt, but the patient often demonstrated a slight excess oxygen intake one or more hours after delivery.

3. Multiparous patients rapidly increased their oxygen intake with delivery, but recovery of basal rates was prompt, often within half hour post partum.

4. Complicated deliveries were accompanied by a persistent elevation of oxygen consumption presumably caused by an increased circulatory load.

5. Five patients with rheumatic heart disease were studied. Two were free of symptoms and presented normal oxygen consumption curves; one had increased dyspnea and developed tachypnea, and a short period of very high rate of oxygen consumption during delivery; and one who was in heart failure at term, maintained a high oxygen intake post partum, and never regained her antepartum cardiac functional capacity. The fifth patient developed signs of serious failure during a prolonged first stage of labor and was uneventfully delivered by cesarean section with no consequential increase of oxygen intake.

6. The work of labor in both primiparous and multiparous women is the equivalent of mild to moderately heavy physical labor, the degree of which cannot always be predicted. In the presence of such a simple complication as a breech delivery, it may be increased markedly. This amount of physical work may be of the order that is commonly considered by clinicians as an unsafe risk for life or for maintenance of maximum function of cardiac patients in the ordinary routine of life. Cesarean section, whereas presenting other risks, does not carry the dangers of this unpredictable load of physical work, although postpartum cardiac death is reported to occur after this procedure for reasons as yet undetermined.

References

1. Boyer, N. H., and Nadas, A. S.: Am. Int. Med. 20: 99, 1944.
2. Hamilton, B. E., and Thomson, K. J.: The Heart in Pregnancy and the Childbearing Age, 1941, Boston, Little, Brown & Co., p. 96.

3. Hoffman, G. L., Jr., and Jeffers, W. A.: Am. J. M. Sc. **204**: 157, 1942.
4. Hamilton, B. E., and Thomson, K. J.: The Heart in Pregnancy and the Childbearing Age, Boston, 1941, Little, Brown & Co., p. 101.
5. Cohen, M. E., and Thomson, K. J.: J. A. M. A. **112**: 116, 1939.
6. Burwell, C. S.: Am. J. M. Sc. **195**: 1, 1938.
7. Harrison, T. R.: Failure of the Circulation, Baltimore, 1935, Williams & Wilkins, p. 120.
8. Woodbury, R. A., Hamilton, W. F., and Torpin, R.: Am. J. Physiol. **121**: 640, 1938.
9. Stahler, F.: Abh. aus d. Geburtsch. u. Gynäk. u. Ihren Grenzgebieten **7**: 1936.
10. Lusk, G.: J. A. M. A. **70**: 821, 1918.
11. Gagge, A. P.: Science **93**: 551, 1941.
12. Shock, N.: Personal Communication.
13. Lusk, G.: J. Biol. Chem. **49**: 41, 1924.
14. Margaria, R., Edwards, H. T., and Dill: Am. J. Physiol. **106**: 713, 1933.
15. Hill and Flack, M.: Am. J. Physiol. **37**: 27, 1909; **40**: 347, 1910.
16. Sampson, J. J.: West. J. Surg. **51**: 107, 1943.

THE COMPARATIVE ACTION OF POSTERIOR PITUITARY AND ERGONOVINE IN THE THIRD AND FOURTH STAGES OF LABOR*

Observations Based on 5,000 Deliveries

MORRIS LEFF, M.D., NEW YORK, N. Y.

THERE has been a considerable reduction in the maternal mortality in the last ten years, but deaths due to hemorrhage have not declined proportionately as have deaths from infection or toxemia. It behooves us to investigate further ways and means of controlling postpartum hemorrhage.

The oxytocics, posterior pituitary and ergot, are very potent in causing the uterus to contract, and they have been a great aid in the control of postpartum hemorrhage. In recent years ergonovine, which can be given intramuscularly and intravenously, and whose action is very prompt, has come into use. It is very effective in causing the immediate contraction of the uterus. We had great expectations that ergonovine would be the ideal drug to solve the problem of postpartum hemorrhage. Theoretically, it seemed logical that a drug which acts so promptly and produces firm contraction of the uterus should eliminate postpartum hemorrhage, but the results were not what we had hoped for.

We had used ergonovine intravenously or intramuscularly as soon as the placenta was expressed in over 2,500 deliveries. The uterus contracted firmly in less than one minute, but bleeding occurred, persisted, and recurred notwithstanding an apparently well-contracted uterus. For a time we were puzzled and at a loss to understand why that should be so, but now we believe we have an explanation for this occurrence.

In considering the physiology of the uterus during labor, we know that it involves a process of contraction and retraction of the uterine muscle fibers. There must be retraction together with contraction in order to produce dilatation of the cervix and to accomplish the expul-

*Read at a meeting of the Section of Obstetrics and Gynecology of the New York Academy of Medicine, Nov. 28, 1944.

sion of the fetus. The same process continues in the third and fourth stages of labor.

Ergot and its derivatives cause contraction of the uterus and maintain it in a tonic state of contraction but they do not produce retraction of the muscle fibers. To produce retraction, it is necessary to have rhythmic contractions and relaxations which recur intermittently. This is what takes place in normal labor and with posterior pituitary but not with ergot.

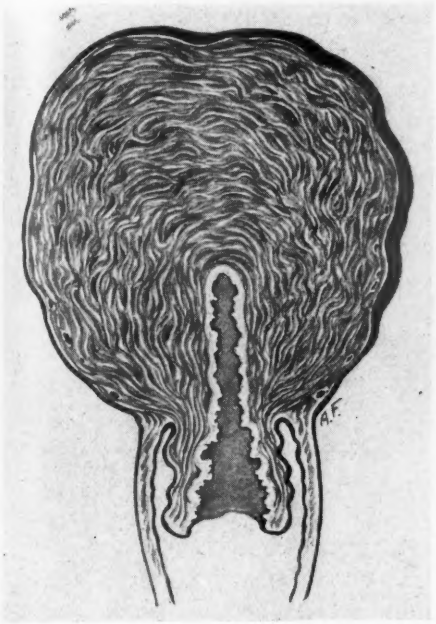


Fig. 1.

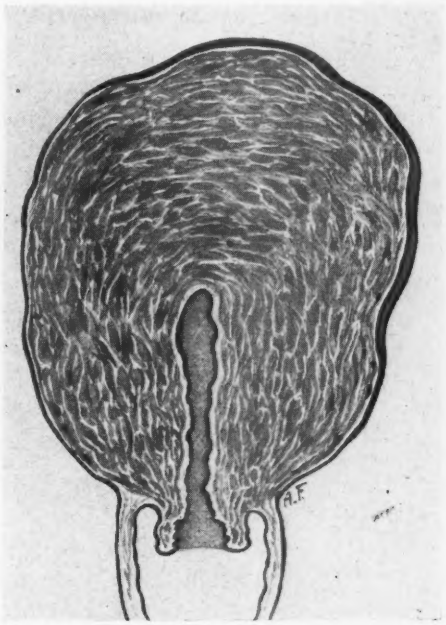


Fig. 2.

Fig. 1.—The uterus after ergonovine. The uterus is contracted, but the muscle fibers are not retracted. The cervix is elongated, relaxed, and flabby. The cervix hangs loosely in the vagina.

Fig. 2.—The uterus after posterior pituitary. The uterus is contracted, the muscle fibers are retracted, causing the bleeding sinuses to be obliterated. The cervix is retracted and is back to a normal state.

When ergonovine is given immediately after the placenta is delivered, the uterus goes into a state of tonic contraction, but retraction does not take place. The muscle fibers below the isthmus and the fibers of the cervix are not drawn up into the body of the uterus, but instead the cervix remains elongated, relaxed, and flabby, and hangs loosely in the vagina, while the body of the uterus and fundus are contracted (Fig. 1). We found this condition to be so by doing routine vaginal examinations in the third and fourth stages of labor. As the cervix and lower uterine segment are very vascular and congested during labor and as retraction does not take place, the bleeding vessels are not obliterated and as a consequence bleeding persists from this area notwithstanding a contracted uterus. In cases where there is a low insertion of the placenta, the bleeding from the congested area and sinuses may be considerable. When bleeding occurs with a firmly contracted uterus, it is, as a rule, attributed to a laceration of the cervix, but that is not necessarily so as the bleeding is more likely to be from a cervix that has not retracted.

When the uterus is contracted by the ergonovine and the cervix is not retracted but remains elongated and relaxed, the condition is un-

physiologic and it cannot remain that way for long. After a while the uterus must go through the process of retraction in order to take up the elongated fibers of the cervix. During this process the uterus will relax again and hemorrhage will recur. This is what causes hemorrhage to recommence after the uterus had been firmly contracted, and it explains the incidents where the patient starts bleeding again after having been put to bed in apparently good condition. Once bleeding sets in, the uterus fills up with blood clots and it is prevented from contracting properly. The vicious cycle can be controlled only by first removing the blood clots and then compressing the uterus bimanually.

We discontinued giving the ergonovine immediately after the placenta was expressed and now give posterior pituitary instead. When posterior pituitary is given intramuscularly immediately after the placenta is expressed, the uterus goes through the physiologic process of both contraction and retraction, and the fibers of the lower uterine segment and cervix are retracted into the body of the uterus. As a result, the bleeding areas are obliterated and the uterus and cervix return to a normal physiologic state (Fig. 2). During the period of contraction and retraction the uterus has to relax and contract several times and, as a consequence, some bleeding will, of necessity, occur, but this bleeding is unavoidable. However, when the process is over, the uterus and cervix are in the proper state. In order to reduce the bleeding to a minimum during this stage of contraction and relaxation, the uterus should be compressed bimanually, as outlined in a previous paper on the management of the third and fourth stages of labor (1939).

The posterior pituitary is given as soon as the placenta is expressed, which is in about two or three minutes after the baby is born. The action of the posterior pituitary lasts about twenty minutes, during which time the cervix is retracted; we therefore wait that length of time and give the ergonovine intramuscularly twenty minutes after the pituitary has been given but not before that time has elapsed. The ergonovine is purposely given intramuscularly, not intravenously, as we do not want it to act on the uterus too soon, that is, not before the full effect of the pituitary has been attained. In the interval, between the pituitary and ergonovine, repair of the perineum is done.

Ergonovine should not be given before pituitary extract nor at the same time with pituitary, for the reason that the ergonovine puts the uterus in a tonic state of contraction and the pituitary cannot exert its action of contraction and relaxation when the uterus is in a tonic state. The effect of the pituitary would thereby be nullified and it would not produce the necessary retraction.

When bleeding is severe, there is a temptation to give the ergonovine immediately or before the specified twenty minutes have elapsed. This should not be done as the results are not satisfactory. Instead, bimanual compression of the uterus should be practiced as previously indicated, and another ampule of pituitary may be given. Occasionally, posterior pituitary itself will put the uterus in a tonic state and it will have the same effect temporarily as the ergonovine. All we can do then is to wait until this abnormal effect wears off.

Neither posterior pituitary nor ergonovine should be given with the idea of hastening the separation of the placenta, as the placenta separates

by itself as soon as the baby is born and can be expressed in a few minutes, as I have already shown in a paper in 1929. This fact has recently (1942) been confirmed by Danforth, Graham, and Ivy in experimental work done on monkeys.

The management of the third and fourth stages of labor is therefore as follows:

When the baby is born, the cord is tied as soon as the baby has taken one or two deep breaths, but not before. The baby thereby expands its lungs and fills its system with as much blood as it can hold. We do not wait for pulsations in the cord to cease before tying it as the infant does not acquire more blood during the pulsations. If the pulsations were really an indication of blood circulating from the placenta, then the same quantity of blood would flow out of the baby as is supposed to flow into it.

A vaginal examination is made to ascertain whether the cervix has not contracted down on the already separated placenta and the placenta is promptly delivered as described in previous papers. One ampule (10 units) of pitocin is then given intramuscularly. Bimanual compression of the uterus is done to control and minimize the loss of blood in the interval that the pitocin is taking effect, and while the uterus is going through the process of contraction and relaxation.

When the bleeding is fairly well under control, a large wad of moist cotton is placed in the vagina and repair of the episiotomy or lacerations is commenced. The repair is not done before the placenta is delivered nor before the uterus is well contracted and bleeding is controlled.

During the repair, the nurse continues to hold the uterus firmly. If it relaxes or bleeding recurs, the sewing is interrupted and attention is immediately given to the uterus. The cotton sponge is removed from the vagina, vaginal examination is made, clots are removed, and the uterus is again compressed bimanually until the uterus is in a satisfactory state and the bleeding is under control. When the repair is completed, vaginal examination is again done, all clots are removed from the cervix and vagina, and the cervix is palpated to ascertain whether it has retracted.

We then wait the twenty minutes for the pitocin to have its full effect and only then give one ampule (0.2 mg.) of ergotrate intramuscularly. In this way we attain contraction of the uterus with retraction of the cervix and a firm tonic uterus.

If there is still some bleeding or oozing or if the uterus has a tendency to relax, we pack the vagina with iodoform gauze in order to fill up the vagina, so that when the uterus is held and compressed, it is pressed against a solid body rather than an empty space. I wish to repeat what I have maintained in previous papers, that packing the uterus is unphysiologic. Our object is to obliterate the bleeding sinuses, but by packing the uterus, the sinuses are instead distended and not permitted to contract. Bimanual compression of the uterus is a logical means of compressing the sinuses and controlling bleeding.

By giving the pituitary extract immediately after the placenta is delivered and postponing the ergonovine for twenty minutes, our results

have been very much more satisfactory in the last 2,500 cases than in the previous series.

Blood plasma and facilities for blood transfusions should be available, but we must not lose sight of the fact that prevention of the loss of blood is safer and more important than the most elaborate facilities for its replacement. Blood plasma cannot be considered a substitute for whole blood and should be used only while preparation is being made for the transfusion, but it should not delay the transfusion. Glucose and saline may do more harm than good if given while bleeding still continues, for the additional fluid, by raising the blood pressure, may aggravate the bleeding. Blood transfusions, when necessary, should be given as soon as possible; time should not be wasted by lulling ourselves into false security in depending upon substitutes. We must also realize that 500 c.c. of blood is not sufficient to replace four or five times that amount which may have been lost. When the veins are collapsed, it is being advocated that transfusion be given through sternal puncture. More attention must now be given to the Rh factor in transfusions; it is a real danger if ignored.

By managing the third and fourth stages of labor as outlined, we have had most gratifying results and transfusions were rarely necessary.

Summary

Posterior pituitary causes both contraction and retraction of the uterus and produces retraction of the cervix. It should be given immediately after the placenta is delivered.

Ergonovine causes a tonic contraction of the uterus but no retraction and should only be given twenty minutes subsequent to the posterior pituitary extract when retraction of the cervix has already taken place.

The management of the third and fourth stages of labor is reviewed.

References

Danforth, D. N., Graham, R. J., and Ivy, A. C.: Surg., Gynec. & Obst. 74: 188, 1942.

DeLee, J. B., and Greenhill, J. P.: Principles and Practice of Obstetrics, ed. 8, Philadelphia, 1943, W. B. Saunders Co.

Ivy, A. C.: Am. J Obst. & Gynec. 44: 952, 1942.

Ivy, A. C., and Rudolph, L.: Surg., Gynec. & Obst. 67: 188, 1938.

Leff, M.: Am. J. Obst. & Gynec. 18: 868, 1929.

Leff, M.: Surg., Gynec. & Obst. 68: 224, 1939.

Reynolds, S. R. M.: Physiology of the Uterus, New York, 1939, Paul B. Hoeber, Inc.

Titus, Paul: Management of Obstetric Difficulties, ed. 2, St. Louis, 1940, The C. V. Mosby Co.

1831 Grand Concourse

SUPRAVESICAL EXTRAPERITONEAL CESAREAN SECTION (WATERS' TYPE)*

Experience With 250 Operations

EDWARD G. WATERS, PH.B., M.D., F.A.C.S., JERSEY CITY, N. J.
(From the Margaret Hague Maternity Hospital)

RESULTS achieved determine the worth of any operation. Factors conditioning these results vary with the era and the operator, so that one recurrently experiences changes influencing surgical practice. Thus, hazardous and awe-inspiring procedures of one generation become routine performances in the next. Critical comment on any operation is predicated, therefore, upon judicious consideration of its need, advantages, dangers, complications, and results, during the period in which it is offered.

Our purpose is to review experiences with one operation, the supravesical extraperitoneal cesarean section as proposed by the author, and to resubmit various anatomic and operative data concerning it.

It is proper that this operation, by no means new, has gained its rightful place in the operating obstetrician's armamentarium because of factors and considerations either not available or not applied in its older experience.

Without presuming to review its history, which has been dealt with adequately and often, we would like to recall again one anatomic fact closely related to the historical development of extraperitoneal cesarean section. This fact, overlooked throughout the years, is that there are but *two anatomically possible ways to reach the uterus extraperitoneally,* due to the situation of the pregnant uterus in the pelvis, and the location of the peritoneal reflections from its lower segment onto other organs or the pelvic side walls. One possibility is to reach the lower anterior extraperitoneal uterine segment from an approach lateral to the bladder, through the paravesical space. It was recognized and tried in 1821 by Ritgen. Fundamentally, the operations of Baudelocque, Thomas, Skene, and Latzko, in spite of variations in abdominal wall incision and approach, fall into the same group. Of these operations, the Latzko technique is the most popular.

The only other possible way to reach the lower uterine segment extraperitoneally is by a supravesical approach. Physick of Philadelphia in 1824 first proposed this approach to DeWees in Horner's letter. It was not attempted until 1908-1909 when Frank and later Sellheim unsuccessfully tried it. This same approach is the basis for the series of operations I presented in January, 1939. It possesses one radical difference; the plane of dissection. Whereas previous operators attempted to "peel" the peritoneum from the bladder and pelvic fascia, an almost impossible undertaking, the peritoneofascial flap was here "lifted" and dissected as a unit, a perfectly feasible and not too difficult surgical procedure. Therein lies the difference between success or failure in a

*Presented before the Philadelphia Obstetrical Society, Feb. 3, 1944.

rather old procedure, and it is the only modern major contribution to the technique.

To comprehend adequately the surgical technique, an understanding of the investments of the uterus and the bladder is invaluable.

The peritoneum covers the pelvic organs, adapting itself to the bladder, uterus, and bowel in their varied stages of distention. From the anterior abdominal wall, the peritoneum reaches the bladder to cover its superior surface and descend for a short distance over its posterior surface, whence it is reflected upward on the anterior surface of the uterus, thus forming the uterovesical pouch. Laterally from the bladder, the peritoneum bridges the lateral vesical (paravesical) spaces to reach the pelvic side walls, while the lateral reflections from the uterine surfaces to the pelvic walls form, respectively, the anterior and posterior surfaces of the broad ligaments.

In passing from the abdominal wall to the bladder, the peritoneum is lifted by fibrotic cordlike remnants of fetal structures. The obliterated urachus forms the middle umbilical ligament, extending from the apex of the bladder to the umbilicus. The lateral umbilical ligaments, the fibrotic reminders of the once important umbilical or hypogastric arteries, extend from the umbilicus to the bladder lateral to its apex, and vary considerably in size in different women. They are frequently insignificant. The proximal portions of these structures between the bladder and the internal hypogastric arteries persist as vesical arteries. The "draping" of the peritoneum over these ligaments forms depressions, those between the middle and lateral ligaments comprising the supravesical fossae, and those outside of the lateral umbilical ligaments forming the paravesical fossae.

Loose subperitoneal tissue lies between the peritoneum and the pelvic fascia. In certain areas, notably lateral to and behind the bladder and in the base of the broad ligaments, this areolar tissue is well packed with soft fat, filling the spaces between the peritoneum and fascia. Over such areas the peritoneum is loosely applied, whereas over the bladder fundus it is less developed. On the anterior uterine surface, the interposed subperitoneal areolar tissue is extremely thin. The vessels and nerves of the pelvis lie within its substance, and perforate the fascia to reach the viscera. The vesical vessels perforate the fascia vesicae (quod vide) inferolaterally to lie between the fascia and the bladder muscularis. This is a fact of considerable clinical importance. In considering the pelvic fascia, I like to regard it as fulfilling two purposes, i.e., support and envelopment, with the basic and more important function being support. The supporting portion of the endopelvic fascia represents a continuation into the pelvis of the transversalis fascia of the abdomen. It is reflected medially just above the origin of the levator ani muscle and forms with it the upper pelvic diaphragm. Within its substance, and developed in response to functional needs, are condensations of fibers which constitute the well-known pubovesical, cardinal, uterosacral, etc., ligaments. These form, with the broad spread of the endopelvic fascia, the supporting portion.

The investing fasciae develop from the upper pelvic diaphragmatic fascia at the sites of visceral penetration. The bladder is surrounded by it, and thus we have the fascia vesicae or perivesical fascia. Fascia

extends upward to cover the uterus as the fascia uteri or periuterine fascia, and the downward prolongation becomes the vaginal fascia. The investing fasciae of bladder and uterus are adjacent and intimately fused at their origins from the supporting layer of endopelvic fascia, where the bladder base and cervix are held together by the tough pubovesicocervical ligaments.

In the latter part of pregnancy, changes take place in visceral relationships and in the pelvic tissues. The bladder is flattened anteroposteriorly and when distended reaches higher in the abdomen. This, with the growth of the uterus, elevates and loosens the vesico-uterine pouch of peritoneum. The thickened elongated round ligaments lift the peritoneum from the lateral walls of the false pelvis. The pelvic tissues, notably the subperitoneal connective tissue, share in the physiologic increase of intracellular and extracellular water. The distention of the lower uterine segment thins the cervical and uterine fascia and pubocervical ligaments, and separation from the viscera becomes relatively easy. The laminated character of the fibro-elastic fascial envelopment of the bladder is evident at every operation.

From the foregoing, it is clear that one may reach the uterus without entering the peritoneal cavity, by passing between the bladder fascia and its muscularis. An abdominal incision opens the space of Retzius, then an incision in the bladder fascia opens the external end of a tunnel-like approach to the uterus. This artificially created "abdominal-vagina" is developed by further lifting the fascia vesicae with the overlying peritoneum. At the inner end, the fascia vesicae and fascia uteri must be incised to permit elevation of the uterovesical pouch of peritoneum, to complete the extraperitoneal subfascial tunnel from abdominal wall to uterine muscle. Thus the roof of this tunnel is the elevated peritoneum which covered the bladder and vesico-uterine space, with the attached fascia resected from the dome of the bladder and the lower uterine segment. The base of the tunnel is the denuded bladder and the pubocervical fascia. The lateral tissue is the fascia spread from the lateral umbilical ligaments, which marks the extent of the supravesical fossa.

The foregoing clarifies the description of the operation and includes the latterly developed features.

Operative Preparation

Prophylaxis.—The patient is typed, and cross-matched bank blood of the same type is assured. All bleeding cases and any with pre-existing anemia are typed, cross matched, and suitable blood readied before operation. Dehydration is treated if present, and lavage done on vomiting patients.

Vaginal.—The vaginal orifice and tract are thoroughly antisepticized and a careful and complete vaginal examination made. The fetal head, if fixed, is pushed well upwards to facilitate its later extraction as recommended by Jellinghaus. An indwelling catheter is inserted into the bladder, and tested for free inflow and outflow. It is connected to an irrigator containing a sterile solution of water colored with methylene blue. Prior to abdominal incision, the bladder is filled with 150 to 200 c.c. of solution, or enough to obtain moderate distention. This is maintained until bladder dissection is well advanced.

Abdominal.—The abdomen is thoroughly cleansed and prepared for incision with an efficient antiseptic. It is draped to expose a low operative field between umbilicus and symphysis.

Instruments.—Fritsch abdominal retractors are best for retracting the bladder below and the peritoneofascial flap above. For lateral retraction, Richardson 1½ inch retractors are least traumatic. Adequate exposure through good retraction is essential.

After the initial central "nick" in the uterine wall, bandage scissors are used to complete the crescentic incision. One blade of an Elliott or Simpson forceps is used as a vectis to deliver the baby's head. Constant suction is employed after the uterus has been opened, to clear the operating field.

The incised uterine wall is best held with De Lee T-clamps.

The Operation

The abdominal incision is a left lower rectus "trap door" from pubes to two-thirds of the umbilicus. The pyramidalis is separated from the lower end of the rectus muscle. Or Pfannenstiel's incision, which is satisfactory, may be chosen.

After retracting the rectus muscle laterally, the already distended bladder may be seen through the overlying transversalis and perivesical fasciae. The relatively thin transversalis fascia with some thickened transverse trabeculae is incised vertically. A "T" shaped incision is made in the perivesical fascia in the following manner: A 1-inch vertical incision is made through the laminated fascia covering the distended bladder down to its muscularis, at a point about two-thirds of the distance up on the exposed bladder. The Bard-Parker knife handle is inserted downward between bladder fascia and muscularis, the tissue freed, and the fascia then divided vertically with a Mayo scissors. This permits the filled bladder to herniate forward. (The vesical vessels lie between fascia and muscularis, and serve to orient the operator.) The cross of the T incision in the fascia, which must be generous, is made by insinuating curved Mayo scissors betwen bladder fascia and muscle and dissecting as in a cystocele operation, cutting after visualizing. The fascia, though laminated, is easily separable as a unit with knife handle and Mayo scissors. Laterally it fans out and thins where it contains enmeshed fat tissue. At the urachus it is adherent, and when a large exposure is needed, the urachus must be "surrounded" by dissection, doubly tied and cut, lest the peritoneum be torn there.

The peritoneofascial (P.F.) flap or fold is now lifted upward by Mayo scissors and knife handle dissection keeping close to the bladder muscle. The dissection proceeds over the top and left upper corner of the bladder, seeking the most accessible portion of the uterovesical fold of peritoneum.

It is best *to empty the bladder at this stage.* The P.F. flap and bladder are now drawn apart using gauze, until the uterovesical plica is identified lying against the lower segment. (The lower segment is now being viewed through the posterior portion of the fascial envelope of the bladder and the uterine fascia over the lower segment.)

An incision is made below the hernial saclike fold of uterovesical peritoneum and through the fascial layers noted, down to the glistening muscularis of the lower segment. The finger is inserted then beneath these fasciae, and the fascia and bladder are stripped and freed from the front of the lower uterine segment. (This is comparable to the procedure, in lower segment transperitoneal cesareans, whereby the bladder is freed from the lower uterine segment.)

Obviously, to expose a large lower extraperitoneal segment it is now necessary to cut through the posterior portion of the perivesical fascia still attached to the bladder, starting with the initial opening below the hernia-like plica. This is done by knife dissection, using the handle to push the bladder muscularis away. This permits visualization of the intact P.F. fold before cutting the fascia close to the bladder, where-

upon the P.F. fold is completely freed of attachment and lifted upward from the bladder. The bladder is dropped below the pubis and retracted with a Fritsch retractor. Lateral fascial retraction is obtained with 1½ inch Richardson retractors.

A centrally placed transverse "nick" is made in the exposed uterine segment 1½ inches above the depth of the bladder effacement, down to membranes. Cultures are taken from amniotic sac (and later, after removing the fetus, from the cervical segment). With a bandage scissors placed in the "nick," a crescentic incision is carried in either direction, first to left, then right, the ends reaching a level about 1½ inches above the "nick." The size of the baby's head determines to a degree the acuteness of the curve. The ends always avoid the broad ligaments. No attempt is made to control any uterine wall bleeding until the baby has been removed from the uterus.

In vertex presentations, one blade of a forceps is passed in laterally, then swung below the disengaged head and used as a vectis to pry and lift out the head, with strong fundal counterpressure being exerted to facilitate delivery. It is best first to turn the head so that the occiput presents in the wound and birth is by extension. Breech deliveries are simple, and internal versions may be performed. The baby is removed, and the edges of the wound grasped with T-clamps using one at each end and one in the center of each crescent. Ergotrate is given intravenously and the placenta and membranes are immediately extracted manually.

Two layers of No. 1 chromic single sutures are placed in the uterus. The first is a running stitch beginning at the left end of the incision with stitches placed accurately and closely. The second layer is a Cushing continuous stitch, completely inverting the first. In the event of uterine wound infection, discharge into the cervical segment and lochia is effected. This suture also produces direct uterine fascial approximation, a most important factor in sound uterine wall healing.

The operative area is dried and No. 0000 chromic ties placed on any bleeding points. "Sulfa" powder is sprinkled (not packed) over the retrovesical tissues and a Penrose rubber tissue drain placed in the retrovesical space and brought out of the lower end of the wound. The peritoneofascial flap is replaced over the bladder from whence it was lifted by dissection. Fine interrupted sutures reapproximate the left rectus to the median raphe. The rectus fascia is sutured with continuous No. 1 chromic catgut and the abdominal wall closed with silk or Michel clips.

Certain minor variations in technique may be employed, depending upon the patient and the operator. For identification, the amount of bladder fill may vary from none to 400 or 500 cubic centimeters. Fascial identification and the "T" incision in the fascia are simpler with a well-filled bladder, but further fascial dissection is easier and quicker with the bladder nearly empty. An overdistended bladder or one with a large fundal "air-bubble" is easily perforated. The inserted catheter alone may serve as a guide to bladder outline.

To briefly review the manner of fascial incisions, it is seen that first the thin transversalis fascia is incised. Then the perivesical fascia is divided as it covers the fundal portion of the bladder near the parietovesical peritoneal reflection. After separation of this, especially over the left upper bladder angle, the same layer is again incised posteriorly to expose the fascia covering the lower uterine segment. Thus the bladder is "denuded of a fascial skullcap" which remains attached to the peritoneum, from bladder fundus to the uterovesical pouch. This permits the peritoneum to be freely and easily lifted and the bladder dropped below the symphysis behind a Fritsch retractor. Transverse incision of uterine fascia over the lower segment increases the mobility of the uterine peritoneum. The rest of the operation is essentially a laparotrachelotomy with (Kerr) transverse crescentic incision through the lower uterine

segment. The exposed field permits any type of uterine wall incision but the transverse crescent is by all odds the best.

Postoperative Care.—The drain is left in two to five days, depending upon the infectivity of the case. The catheter is left in two days to rest the bladder. Prostigmine (P) is given every 4 hours for 24 hours; then every 6 hours for 24 hours, with rectal tube for ½ to 1 hour after each injection. Patients are usually permitted fluids immediately, soft diet in twenty-four hours and regular diet in forty-eight hours. Intravenous fluids and blood transfusions are used on the slightest indication.

Statistical Data and Comment

The tables setting forth the statistical data are self-explanatory. There are certain inclosures which bear emphasis and comment. These are offered for the benefit of the fortunately diminishing groups offering classical sections as routine operations for all but the "lost hope" patients.

The total cesarean incidence is 2.67 per cent. Of 1,837 cesareans in this twelve-year period, 23.4 per cent were of some extraperitoneal type. This incidence reflects the demonstrated safety and progressive use of the operation. In the past six years, most of these have been of the type described by the author. Our experience in the 431 extraperitoneal sections, including 250 of the supravesical type, demonstrates such a low mortality that we almost never use a Porro operation, do a craniotomy on a living child, or hesitate to use it where we believe an intrauterine infection is probable or even remotely possible. The figures in Table II are absolute. The vast majority of the extraperitoneal operations were performed on bad risk patients. In Table III are tabulated the cases with established sepsis before or during labor. Yet of the maternal deaths in the supravesical group, only one died from sepsis although the major cause of death from all cesareans listed was sepsis in some form.

Who can study the comparative data in this table of nearly 2,000 cesarean sections of various types and say that extraperitoneal sections are hazardous, rarely indicated, suggest bad handling of material, are too difficult, or incorporate a high mortality rate? The rather moderate technical difficulty of the extraperitoneal operation is certainly no excuse for failing to perform it where the indication is present, and the indication should be *any potentially infected* case. To reserve it solely for badly infected or septicemic patients is comparable to awaiting appendiceal rupture and peritonitis before operating. If the reader will scrutinize the mortality table, he will understand why we unequivocally insist upon a low cervical segment operation for elective and clean cases and extraperitoneal operation for any in which a "reasonable doubt" exists.

Employing the technique described in this paper, there were four bladder perforations in the 250 extraperitoneal sections. There were no persisting fistulas, since all perforations are easy to see and repair. Unless there is a pyelocystitis, puncture of the bladder, though certainly not recommended, is totally unimportant. But peritoneal punctures may be very dangerous. Although the number is high, it is lower, we believe, than previously reported for any considerable number of extraperitoneal sections. All but two, however, were made, recognized, and repaired *before* the uterus was incised. In other words, *in only two cases was*

TABLE I. GENERAL CESAREAN SECTION DATA—OCTOBER, 1931, TO JAN. 1, 1944

	NUMBER	PER CENT INCIDENCE
Total deliveries	68,786	0.278 or 1 in 360
Maternal mortality	191	2.67 or 1 in 37.4
Total cesareans	1,837	1.52 or 1 in 66
Cesarean mortality	28	

TABLE II. TYPE OF CESAREAN OPERATIONS

		MORTALITY	
	NO.	NO.	PER CENT
Transperitoneal and exclusion types	1261	13	1.03
Extraperitoneal cesareans	431	5	1.16
a) Waters' supravesical	250	2	0.8
b) Latzko's paravesical	181	3	1.65
Classical	117	8	6.8
Hysterectomy (Porro)	27	2	7.4
Vaginal	1		
Postmortem (cesarean section)	10		

TABLE III. SUPRAVESICAL EXTRAPERITONEAL CESAREAN (WATERS)

Total cases, 1937 to Jan. 1, 1944			250
Deaths			2 or 0.8%
Preoperative morbidity and sepsis		90 cases	
Uterine cultures at operation—60 positive, 56 with pathogenic bacteria, 2 septicemia			
Anesthesia			
Spinal	190	Gas oxygen ether	8
Spinal plus ether	51	Cyclopropane	1
Operating time—Average, first 75 cases		36 min.	
Commonly		40-60 min.	
Number of operators	29		
Complications:			
Bladder perforations	4		
Persisting fistulae	0		
Pulmonary embolism	1		
Peritoneal punctures	68 or 27% (All but two occurred *before* opening uterus; 23 in "first" operations 4 deliberate for postoperative tubal ligation)		

there peritoneal cavity communication with an infected operating field. The safety factor thus achieved in this operation is an asset of utmost importance.

The type of anesthesia reduces mortality. For more than fifteen years we have used spinal anesthesia for cesarean section. Two hundred and forty-one of the 250 extraperitoneal cases here reported were given either spinal anesthesia alone (190) or spinal with some terminal anesthesia. We believe it to be one of the safest anesthetics for cesarean section, all things considered. No spinal death is ever explained away, wherever it happens. Irrespective of attendant factors and conditions which might have made *any* anesthetic a great risk, the agent employed bears the full responsibility. With any agent other than spinal, a death under anesthesia is commonly attributed to attendant conditions necessitating or influencing the operation. This attitude is obviously unfair and prejudices honest appraisal of the anesthetics used. In this instance, a consideration of the total deaths from *all* causes in 250 operations, where 241 had spinal anesthesia, is advised. If this form of anesthesia produced the bad results promised by those who neither use it nor possess substantiating experience, we would not recommend it after fifteen years of use on thousands of parturient women.

In conclusion, it is felt that the experiences provided by these 250 supravesical extraperitoneal cesareans prove it to be a safe and satisfactory routine operation for any potentially infected patient requiring cesarean section.

References

Ritgen, F. A.: Heidelberger Klin. Annal. **1**: 263, 1825, pt. 2.
Baudelocque: Rev. méd. franç. et étrangère, 1824.
Thomas, T. G.: Am. J. Obst. & Dis. Women **3**: 125, 1870; **8**: 326, 1875.
Chambers, P. F.: Am. J. Obst. & Dis. Women **47**: 502, 1903.
Latzko: Zentralbl. f. Gynäk. **20**: 131, 1908; **33**: 769, 1909; Wien. klin. Wchnschr. **22**: 477, 1909.
Norton, J. F.: AM. J. OBST. & GYNEC. **30**: 209, 1935.
Burns, H. T.: AM. J. OBST. & GYNEC. **19**: 759, 1930; **28**: 556, 1934.
De Wees, W. P.: (Physick reference) Compendious System of Midwifery, ed. 8, 1839, p. 598.
Frank, F.: Arch. f. Gynäk. **81**: 46, 1906; Zentralbl. f. Gynäk. **5**: 593, 1881.
Sellheim, H.: Zentralbl. f. Gynäk. 133, 319, 641, 1297, 1908; Medical Ann. 226, 1911 (Trans. by E. W. Hey Groves); Monatschr. f. Geburtsh. u. Gynäk. **34**: 34, 1911.
Waters, E. G.: AM. J. OBST. & GYNEC. **39**: 423, 1940.
Kehrer, F. A.: Arch. f. Gynäk. **19-20**: 177, 1882; Beitr. z. Geburtsh. u. Gynäk. **17**: 206, 1912.
Kerr. J. M. M.: J. Obst. & Gynec. Brit. Emp. **28**: 475, 1921; Proc. Roy. Soc. Med. **29**: 1645, 1936.
Krönig, B.: Operative Gynäkologie, ed. 3, Leipzig, 1912, p. 879.
Küstner, O.: Der abdominale Kaiserschmitt (Deuts. Frauenheilk., ii), 1915.
Furniss, H. D.: AM. J. OBST. & GYNEC. **19**: 849, 1930.
Waters, E. G.: AM. J. OBST. & GYNEC. **29**: 535, 1935.

SULFONAMIDE THERAPY IN GONOCOCCAL INFECTION IN WOMEN*

(Sulfanilamide, Sulfapyridine, Sulfathiazole, and Sulfadiazine)

H. CLOSE HESSELTINE, M.D., LUCILE R. HAC, PH.D., FRED L. ADAIR, M.D., AND DONALD K. HIBBS, M.D., CHICAGO, ILL.

(From the Department of Obstetrics and Gynecology, the University of Chicago and the Chicago Lying-in Hospital, and the Chicago Municipal Social Hygiene Clinic)

THE value of sulfonamide therapy in gonococcal infection has been well established and we have not attempted to review the literature. Generally, conclusions concerning the effectiveness of the various drugs have been based primarily upon results obtained in men. The part women can play in the spread of this infection, however, makes it imperative that their treatment be evaluated accurately. It is essential to determine: (1) to which sulfonamides these women respond most surely and promptly; (2) how long organisms may be harbored with few or no symptoms; (3) when the carrier state ends; and (4) whether so-called "drug-fast" strains are produced frequently.

This report is the result of a four-year study of sulfonamide therapy in gonococcal infection in women.† A sufficiently large series of women

*This work was done under a grant from the Albert B. Kuppenheimer Foundation, the Department of Obstetrics and Gynecology, the University of Chicago and the Chicago Lying-in Hospital.

†Most of the patients in this study were made available through Dr. Herman N. Bundesen, President of the Chicago Board of Health, and Dr. G. G. Taylor, Director of Syphilis and Gonorrhea Section of the Municipal Social Hygiene Clinic of Chicago.

were treated with each of the sulfonamides* to draw accurate conclusions concerning the best methods of diagnosis and treatment, and to determine the drug of choice and the necessary criteria of cure of the infection.

During the course of this investigation, 1,126 women were treated with sulfanilamide, sulfapyridine, sulfathiazole or sulfadiazine. Our criteria of cure required that the patients be observed at least two months following therapy before they could be discharged as cured. Consequently, 551 patients who responded to treatment but became delinquent before the observation period was completed have been deleted. The remaining 575 patients who were discharged as cured, or who failed to respond to therapy are considered in detail here. Of these, 430 (75 per cent) responded to one course of therapy and were discharged cured; 145 had repeated or recurrent positive cultures and received further therapy.

Probably the most difficult problem in the evaluation of treatment of an infection such as gonorrhea lies in the differentiation between reinfection and actual failure of the patient to respond to treatment. Considerable time and effort were expended upon those patients who had recurrent positive cultures, and every possible means was utilized to determine the cause. Much of the credit for the final differentiation is due to residents and interns who cooperated in this study and succeeded in eliciting the confidence of the patients as well as their cooperation.

If the patient admitted sexual intercourse, or if smears showed the presence of spermatozoa, reinfection was considered to have taken place. Our efforts to find and determine the infectiousness of the partner were not too successful, and we realize that the recurrence of positive findings may have been due to exacerbation of a latent infection rather than reinfection. For that reason, failure of therapy has been computed in two ways. One method excludes the patients from whom evidence of intercourse and possible exposure to infection were obtained; the other method includes them as possible failures. We believe that most of these patients actually became reinfected, but in a series less well controlled and checked, they might have appeared as "drug failures." On several occasions, patients had been studied several weeks or even months and had received repeated courses of therapy before we discovered that they were being constantly exposed to reinfection.

Methods

All of the patients were ambulatory. A few of them were treated at the Max Epstein Clinic of the University of Chicago, but most of them were from the Chicago Municipal Social Hygiene Clinic. Fifty-one patients were pregnant. Eighty-five per cent were Negroes.

Diagnosis and Criteria of Cure.—The plan of procedure in the study of patients was outlined in detail in previous papers.[1-3] Diagnosis in

*The sulfonamides used in this study were furnished through the courtesy of the Medical Research Departments of: (1) Winthrop Chemical Company, New York City, (sulfanilamide and sulfathiazole); (2) Merck and Company, Rahway, N. J., (Sulfapyridine); and (3) Lederle Laboratories, Incorporated, Pearl River, N. Y. (sulfadiazine).

every case was based on isolation and identification of the gonococcus in pure culture. Cure was determined by routine cultures and smears taken two or three times a week during treatment, twice a week for the first month after cultures had become negative, and at least once a week thereafter. Smears and cultures were also taken during and just following the menstrual period. The provocative test, which consisted of application of 10 per cent silver nitrate to the cervix and 5 per cent silver nitrate to the urethra was performed on the first or second postmenstrual day. Cultures were taken just before silver nitrate was introduced, and on the first and fourth days subsequently.

At first our criteria of cure required that patients have negative cultures and smears through three menstrual periods and two postmenstrual provocative tests. Practically, this proved to be too rigorous a requirement although 235 patients did fulfill it. Of these, only two patients in whom there was no evidence of reinfection had recurrent positive cultures during the third month of observation, but both of them became delinquent before failure of therapy could be substantiated.

All of the 575 patients considered here have been observed through two negative menstrual periods and one postmenstrual provocative test. Patients who did not menstruate (12 were postmenopausal and 18 had had hysterectomies) were observed for two months and received two provocative tests. The 51 pregnant patients were not given provocative tests, but were checked by smears and cultures taken about six weeks post partum.

Treatment.—Sulfanilamide, sulfapyridine, sulfathiazole, and sulfadiazine were used in the treatment of this infection. Patients were assigned in rotation to the various drugs insofar as it was practical. Four doses of drug were given daily and six days constituted a course of treatment with all drugs except sufanilamide, which was given for fourteen days. The dosage schedules for each of the drugs are listed in Table I.

TABLE I. SULFONAMIDE DOSAGE IN AMBULATORY CASES OF GONOCOCCAL INFECTION IN WOMEN

DRUG	DAILY DOSAGE*		NO. OF DAYS	TOTAL NO. OF DAYS	TOTAL DOSAGE	
	GRAMS	GRAINS			GRAMS	GRAINS
Sulfanilamide	4	60	4	14	42	630
	2.6	40	10			
Sulfapyridine or	3	45	2	6	14	210
Sulfathiazole	2	30	4			
Sulfadiazine	2	30	6	6	12	180

*Divided into four doses as nearly equal as practical in amounts and at about five-hour intervals, or from first to last dose a time lapse of 15 hours.

If a patient failed to respond to one course of treatment or became reinfected during the period of observation, a second course of the same drug was occasionally tried, but usually a different sulfonamide was used. Three to seven days usually intervened between courses of treatment.

Only one course of treatment was required to effect a cure in 430 (75 per cent) patients; 4 who were still infectious after one course of therapy became delinquent. More than one course of treatment was given 41 patients who failed to respond to the initial therapy and to 101 patients who were presumably reinfected. Forty-five patients received two or three courses of the same drug. Of those given only one drug, 98 received sulfanilamide, 128 sulfapyridine, 151 sulfathiazole and 102 sulfadiazine. Ninety patients received two drugs and six received three drugs. The number of courses of therapy, with the same or different drug, required in treatment is listed in Table II. In Table III, are

TABLE II. NUMBER OF PATIENTS AND COURSES OF TREATMENT RECEIVED

NO. PATIENTS			NO. COURSES
430	1 course—discharged cured		430
4	1 course—became delinquent—infectious		4
141	More than 1 course		324
96	2 courses	172	
32	3 courses	96	
10	4 courses	40	
2	5 courses	10	
1	6 courses	6	
Total 575			758

TABLE III. NUMBER OF PATIENTS TREATED WITH EACH DRUG AND THE NUMBER OF DRUGS RECEIVED BY EACH PATIENT

DRUG	ONE COURSE ONE DRUG	MORE THAN ONE COURSE ONE DRUG	MORE THAN ONE COURSE TWO DRUGS*	MORE THAN ONE COURSE THREE DRUGS†	TOTAL PATIENTS TREATED WITH EACH DRUG
Sulfanilamide	89	9	38	5	141
Sulfapyridine	114	14	46	6	180
Sulfathiazole	134	17	72	6	229
Sulfadiazine	97	5	24	1	127
Total Therapies	434	45	180	18	677
Total Individuals	434	45	90	6	575

*17 patients received sulfanilamide and sulfapyridine
21 patients received sulfanilamide and sulfathiazole
28 patients received sulfapyridine and sulfathiazole
1 patient received sulfapyridine and sulfadiazine
23 patients received sulfathiazole and sulfadiazine
†5 patients received sulfanilamide, sulfapyridine and sulfathiazole
1 patient received sulfapyridine, sulfathiazole and sulfadiazine

shown the number of patients who received each drug and the number of drugs given each patient. Since one patient might receive two or three drugs, the total number of different patients receiving the various drugs was 677 although only 575 individuals were studied. A total of 141 patients were given sulfanilamide, 180 sulfapyridine, 229 sulfathiazole and 127 sulfadiazine.

Results

The responses to the various drugs shown in Table IV have been listed under the headings "cure," "reinfection" and "failure." Those patients considered cured were observed through two negative menstrual periods and one postmenstrual provocative test before they were discharged. Of the patients treated with sulfanilamide, 71 per cent were discharged cured, with sulfapyridine 82 per cent, with sulfathiazole 87 per cent and with sulfadiazine 94 per cent. Six patients required two

TABLE IV. RESPONSE TO SULFONAMIDE THERAPY IN GONOCOCCAL INFECTION IN WOMEN

	SULFANILAMIDE			SULFAPYRIDINE			SULFATHIAZOLE			SULFADIAZINE		
	CURE	REINFECTED	FAILURE	CURE	REINFECTED	FAILURE	CURE	REINFECTED	FAILURE	CURE	REINFECTED	FAILURE
One course	86			113			134			97		
Repeated courses—1 drug	0		22	2		9	3		6	1		1
Reinfection	9	18*		12	21*		14	20*		4	5*	
Repeated courses—2 to 3 drugs	0		1	9		3	19		2	4		1
Reinfection	5			11			31			14		
Subtotals	100	18	23	147	21	12	201	20	8	120	5	2
Total		141			180			229			127	

*Discharged or delinquent subsequent therapy.

or more courses of the same drug to effect cure, but since they were eventually cured by one type of therapy, the initial failure to respond to treatment was not listed with the "drug-failures."

The patients listed in the "reinfection" group responded to therapy, but had recurrent positive cultures during the period of observation. All of them either admitted sexual intercourse, or spermatozoa were found on the smears. Presumably most of these patients were cured and then were reinfected, but they did not fulfill the criteria of cure. (Some of them may have had an exacerbation of a latent infection brought about by intercourse.) Facilities were not available for us to ascertain the state of infectivity of the partner except in a few instances. In those cases, cure was effected after both partners had been treated. In Table V, the reinfections (sulfanilamide 13 per cent, sulfapyridine 12 per cent, sulfathiazole 9 per cent and sulfadiazine 4 per cent) have been listed separately and also grouped with the failures. The latter figure is undoubtedly higher than the actual percentage of patients that failed to respond to therapy, but probably corresponds to the figures obtained in studies where it was impossible to investigate the problem of reinfection.

TABLE V. EFFICACY OF SULFONAMIDE THERAPY IN GONOCOCCAL INFECTION IN WOMEN

	TOTAL	REINFECTION		TOTAL FAILURES		NUMBER OF PATIENTS DISCHARGED CURED	
		NO.	%	NO.	%	NO.	%
Sulfanilamide	141	18	13	23	16	100	71
Sulfapyridine	180	21	12	12	6	147	82
Sulfathiazole	229	20	9	8	4	201	87
Sulfadiazine	127	5	4	2	2	120	94

TABLE VI. FAILURE OF SULFONAMIDE THERAPY IN GONOCOCCAL INFECTION IN WOMEN—REINFECTIONS DELETED

	NO. OF PATIENTS	TOTAL FAILURES		SECONDARY FAILURE*		INITIAL FAILURE†	
		NO.	%	NO.	%	NO.	%
Sulfanilamide	123	23	19	1	2	22	17
Sulfapyridine	159	12	8	3	2	9	6
Sulfathiazole	209	8	4	2	1	6	3
Sulfadiazine	122	2	2	1	1	1	1

*Failure following failure on one or more sulfonamides previously.
†Failure on first drug received.

Patients who failed to respond to therapy and in whom there was no evidence of exposure to reinfection were considered failures. With sulfanilamide, there were 23 patients (16 per cent), with sulfapyridine 12 (6 per cent), with sulfathiazole 8 (4 per cent) and with sulfadiazine 2 (2 per cent). Since some of these failures were in patients who had failed to respond to previous sulfonamide therapy, it may have been that drug-fast strains were produced by the initial therapy. The true failures are probably those listed in Table VI, from which the group of patients who had been exposed to reinfection has been deleted, and in which initial and secondary failures have been separated.

In Table VII, are shown the results of subsequent therapy in those patients, who failed to respond to the first drug used.

Pregnant Patients.—Nine of the group of 61 pregnant patients (15 per cent) failed to respond to initial therapy, whereas the failure rate in the whole group of 575 patients was only 7 per cent. Four of the patients aborted, and in two of them, cure was effected only after abortion. One other patient, who had recurrent positive cultures after delivery was cured when treated post partum. In Table VIII, a comparison is made of the efficacy of therapy in pregnant and nonpregnant patients.

TABLE VII. EFFECT OF SUBSEQUENT TREATMENT OF PATIENTS WHO FAILED TO RESPOND TO INITIAL THERAPY

SULFANILAMIDE	SULFAPYRIDINE	SULFATHIAZOLE	SULFADIAZINE
22 cases	9 cases	6 cases	1 case
3 delinquent 7 cured with sulfapyridine 1 delinquent with sulfapyridine 3 failures with sulfapyridine but cured with sulfathiazole 7 cured with sulfathiazole 1 delinquent. Failure with both sulfapyridine and sulfathiazole	1 delinquent 6 cured with sulfathiazole 1 delinquent with sulfathiazole 1 failure with sulfathiazole but cured with sulfadiazine	1 cured with sulfapyridine 5 cured with sulfathiazole	1 cured with sulfathiazole

TABLE VIII. COMPARISON OF EFFICACY OF SULFONAMIDE THERAPY IN GONOCOCCAL INFECTION OF PREGNANT AND NONPREGNANT WOMEN

	NONPREGNANT			PREGNANT		
	TOTAL NO.	NO. FAILURES	%	TOTAL NO.	NO. FAILURES	%
Sulfanilamide	116	18	16	7	4	57
Sulfapyridine	148	6	4	11	3	27
Sulfathiazole	177	4	2	32	2	6
Sulfadiazine	111	1	0.9	11	0	0
Totals	552	29	5	61	9	15

Seventy per cent of the patients were seen post partum. None of their infants developed the infection, and none of them seemed to have been adversely affected by the treatment during pregnancy.

Course of Infection.—The infection was acute in 74 per cent of the patients, and of these 18 per cent had on the initial visit or developed subsequently salpingo-oophoritis or Bartholinitis. Of the 26 per cent of patients who had chronic infections, 20 per cent had these complications. Only 6 (16 per cent) of the 38 initial drug failures were in patients with chronic infections, while 8 (21 per cent) were in patients with acute infections with extensions. Seventeen per cent of the patients were asymptomatic except for a very slight discharge.

Time of Response to Therapy.—All but 3 per cent of the patients who responded to initial therapy had negative cultures the first visit 3 to 6 days after institution of therapy. Of the 38 failures, 22 (58 per cent). 5 of whom were pregnant. had positive cultures throughout treatment. Seventeen of the patients had been given sulfanilamide, 3 sulfapyridine, 1 sulfathiazole and 1 sulfadiazine; that is, 77 per cent of the initial sulfanilamide failures, 33 per cent of the sulfapyridine, 16 per cent of the sulfathiazole and 100 per cent of the sulfadiazine (only 1) failures did not respond to therapy even during treatment. Sixteen other patients became negative during treatment but relapsed later. Four of them were pregnant; in 2, positive cultures first occurred after termination (1 abortion, 1 term delivery). Of the 12 patients who menstruated, 10 had positive cultures within two months. The two exceptions were in a group of 235 patients reported earlier[3] who had been observed three months. They both became delinquent before we could ascertain whether reinfection had occurred.

Provocative Test.—All the menacmic patients were given a provocative test of silver nitrate on the first or second postmenstrual day. Cultures were taken just preceding the instillation of silver nitrate and on the first and fourth day following it. Not all patients were able to return for cultures at the correct intervals, but all had at least one com-

plete provocative test before they were discharged. Many patients had two and a few had three completed tests. As has been stated previously, 9 out of 45 of the initial drug failures were in pregnant patients. Of the remaining 36 patients, 17 were shown to have positive cultures throughout treatment and 12 responded during treatment but subsequently became positive. In the last 7 patients of the failure group, the positive cultures occurred during or just following the menstrual period, and one became positive during the provocative test although negative cultures had been obtained postmenstrually. Menstrual or postmenstrual cultures, therefore, gave valuable information concerning cure in 7 of 12 (57 per cent) of the patients who relapsed after an initial response to therapy. Additional information was obtained in only one instance by the provocative test.

Previously, we had reported that if the provocative test were used as criteria of cure, cultures taken on the fourth day after instillation of the silver nitrate were more reliable than those taken on the first day following it. This conclusion was based on the fact that 8 patients who had positive cultures on the fourth day, had negative cultures postmenstrually, and on the first day following the use of silver nitrate. Further study showed that in every instance these patients had been reinfected.

In an attempt to evaluate better the provocative test, 25 patients who had positive cultures postmenstrually were treated with silver nitrate. Thirteen of them had positive cultures both the first and fourth day following its instillation; 4 had positive cultures the first day, but negative cultures the fourth day; 4 had negative cultures the first day, but positive cultures the fourth day; and 4 had negative cultures on both the first and fourth days. It would seem that the most reliable provocative test is the menstrual period itself.

Concentration of Hemoglobin and Drug.—Hemoglobin determinations* were made on all the patients before and after therapy was instituted in order to determine whether those with anemia responded differently to therapy, and what the effect of therapy was on hemoglobin concentration. Only five of the initial drug failures were in patients whose hemoglobin levels were below 70 per cent, whereas 13 were in patients with hemoglobin concentrations of over 90 per cent. About 20 per cent of the patients showed a slight decrease in hemoglobin after therapy. Only two patients showed an appreciable anemia.

Specimens of blood for determination of concentration of drug in the blood were taken once or twice during therapy. Concentrations as high as 10 mg. per 100 c.c. were obtained in patients who received sulfanilamide, but most of them were between 3 and 4 mg. per 100 cubic centimeters. With sulfapyridine and sulfathiazole, the highest levels were 8 mg. per 100 c.c., most of them being between 2 and 3 milligrams. With a 2-Gm. daily dose of sulfadiazine, the concentration of drug in the blood was usually 4 to 6 mg. per 100 cubic centimeters. Earlier, when a 3-Gm. daily dose was used, levels between 8 and 11 mg. per 100 c.c. were frequent. These semed unnecessarily high and could be dangerous in ambulatory patients. For that reason, the daily dose was lowered to 2 Gm. with no resulting increase in failure of therapy. None of the patients who failed to respond to therapy had abnormally low concentrations of drug in the blood.

Toxicity.—A large number of the patients who received sulfanilamide and sulfapyridine exhibited minor toxic symptoms. The number of toxic symptoms was about as great with sulfadiazine as with sulfathiazole, but both drugs were tolerated better than sulfanilamide or sulfapyridine. Rarely was it necessary to discontinue therapy because of toxic symptoms.

*A carbon monoxide method was used for many tests while the Dare method was used for the rest of tests.

Discussion

In this investigation, 575 women in whom diagnosis and cure of gonococcal infection were based on cultural studies were treated with sulfanilamide, sulfapyridine, sulfathiazole or sulfadiazine. Of these, 51 were pregnant. Seventeen per cent of the patients were asymptomatic except for a slight discharge. The infection was acute in 74 per cent of the cases, and of these, 18 per cent either already had or later developed salpingitis or Bartholin's abscesses. Meanwhile, 20 per cent of the patients with chronic infections had or developed the same complications.

To the best of our knowledge, 101 patients were exposed to one or more infections and became reinfected during the period of observation following treatment; 37 were retreated with the same drug and 64 were given different drugs.

Of the 44 patients who failed to respond to one course of treatment, six responded to repeated courses of the same drug, four became delinquent following one course of therapy while still infectious, 27 were cured by a second drug, and two became delinquent following the second course of treatment. Five patients required more than two drugs. Drug-fast strains of gonococci were thus encountered occasionally.

Sulfadiazine was the drug of choice. With it 94 per cent were cured, with sulfathiazole 87 per cent, with sulfapyridine 82 per cent, and with sulfanilamide 71 per cent. If the patients who were exposed to reinfection were deleted and only failures to initial therapy were considered, the percentage failure with sulfadiazine was 1 per cent, with sulfathiazole 3 per cent, with sulfapyridine 6 per cent and with sulfanilamide 17 per cent. We believe that the low percentage of failures in our group was dependent somewhat upon an optimum dosage. Patients were better able to tolerate small amounts of the drug; and thus, they were more willing to take the drug and also better able to retain it, than when large doses were given.

A careful scrutiny of the patients who failed to respond to initial therapy revealed considerable information. Chronic infections responded to treatment as readily as did acute ones. Twenty-six per cent of the patients had chronic infections, while only 6 (16 per cent) of the 38 patients, who failed to respond to one drug, had chronic infection. Patients with secondary complications responded about as well as did other acute cases. Eighteen per cent of those with acute infections had secondary complications; 8 or 21 per cent of the failures were in cases with secondary complications.

Infection in the pregnant patient was more resistant to sulfonamide therapy than in the nonpregnant patient. Eighteen per cent of the failures were in patients who were pregnant, whereas the pregnant patients comprised only about 9 per cent (51 of 575 patients) of the whole series. The failure rate for the whole series was only 7 per cent (38 of 575). Three of the gravid patients did not respond to treatment until the late puerperium. Not one of the infants developed the infection, and except for the routine instillation of silver nitrate into the conjunctival sac, no other prophylactic measures were used. Not one of the infants seemed to be adversely affected by the treatment during pregnancy.

Ninety-seven per cent of the patients who responded to initial therapy had negative cultures before completion of the course of treatment, whereas 58 per cent of the patients who failed to respond to therapy had positive cultures throughout the course of treatment. Sixteen patients (2.7 per cent of the total number of patients treated) responded to therapy during treatment but later relapsed; 4 of them were pregnant. Of the remaining 12, 7 (57 per cent) had recurrent positive cultures during or just following the menstrual period. One had positive cultures during the menstrual period but did not return for a postmenstrual visit. The other five did not report for observation during the menstrual period. Most patients objected so strongly to visits during the menstrual period, that it was difficult to collect data on cultures during this time. Four of the patients had their first positive cultures following treatment and after the next menstrual period, 2 after the second menstrual period and one after the third menstrual period.

Three patients had relapses before the first menstrual period and one between the first and second menstrual period. One patient was cured only after the cervix had been cauterized.

Only one patient had negative cultures following the menstrual period, but had positive cultures following the provocative test. Since 12 of 25 patients who were given provocative tests when postmenstrual cultures were positive had negative cultures on either the first and/or fourth days after instillation of the silver nitrate, we believe the most reliable provocative test to be the menstrual period itself. No patient should be discharged without negative cultures following one menstrual period and preferably two. Two months' observation with continuous negative cultures and smears following cessation of therapy is sufficiently long in nearly all cases. Of the patients who responded to therapy and later relapsed, less than 1 per cent relapsed after the first month of observation.

Conclusions

1. Sulfadiazine is the drug of choice in the treatment of gonococcal infection in women. Sulfathiazole is slightly less effective. Both drugs gave better results and were better tolerated by the patients, than were sulfanilamide or sulfapyridine.

2. Diagnosis of gonorrhea and criteria of cure, wherever possible, should be based on cultural studies. Patients should be observed through at least one negative menstrual period and preferably two. Negative smears and cultures taken just following the menstrual period should be required. Considerable information is obtained from cultures taken during therapy.

3. The menstrual period is the best provocative test.

4. Complications of salpingitis or Bartholinitis were not associated with more failures of therapy than acute uncomplicated cases.

5. Drug-fast strains were produced in the adult women in less than 1 per cent of the cases.

The authors take pleasure in acknowledging that this extensive study was accomplished by the willing and helpful cooperation by the following resident physicians of the Chicago Lying-in Hospital: Drs. Alice Campbell, Ruth Charles, Lester C. Crismon, Richard S. Donovan, David Feld, Eugene G. Free, A. F. Galloway,

Robert G. Greene, Lewis L. Hall, G. Wardlow Hammond, Henrietta Herbolsheimer, Jerome M. Hopper, S. Charles Kasdon, Franklin E. Kells, Jack Kight, David E. Kopans, Cecelia Kranaskas, George H. Lage, Robert C. Long, C. O. McCormick, Jr., Bernard Mortimer, Ruth O'Brien, Lester Odell, John M. Parrish, Leroy S. Pearce, Woodrow W. Pickardt, Morton W. Thompkins, Laura E. Weber, James D. Wharton and others.

References

Hesseltine, H. C., Hac, L. R., Adair, F. L., and Hibbs, D. K.: Am. J. Syph. Gonor. & Ven. Dis. **25**: 454, 1941.
2. Hac, L. R., Hesseltine, H. C., Adair, F. L., and Hibbs, D. K.: AM. J. OBST. & GYNEC. **41**: 98, 1941.
3. Adair, F. L., and Hac, L. R.: New England J. Med. **227**: 465, 1942.

EXERCISES IN DYSMENORRHEA

JOHN O. HAMAN, M.D., SAN FRANCISCO, CALIF.
(From the Fertility and Endocrine Clinics, Free Hospital for Women, Brookline, Mass.)

ALTHOUGH a great deal of discrepancy exists in the literature with regard to the reported incidence of dysmenorrhea,* no one questions the actual gravity of this widespread ailment. Due to the untold suffering it causes to innumerable women, as well as to its obscure etiology, and the discouraging results of therapy, it constitutes one of the most refractory conditions in gynecology.

Moreover, there is another side to this problem besides the purely medical one, for, owing to the incapacitating effect of dysmenorrhea on large numbers of women in industry, its economic aspect is of tremendous importance. A compilation of sixteen reports on the subject shows that 45.5 per cent of women in childbearing age suffer from dysmenorrhea to some degree, and that 16.6 per cent are seriously handicapped during their menstrual periods.

These percentages may be translated in terms of actual economic loss. Figures derived from the 1940 census of the United States reveal that there are in this country about 32 million females, between 15 and 50 years of age. If 16.6 per cent of them, or about 5.3 million, have severe dysmenorrhea, and if one conservatively estimates two hours per period (for thirteen periods during the year, or a total of 26 hours yearly)† as the average length of time during which a member of this group is incapacitated, one can say roughly that 140 million hours are lost annually, due to this cause. The magnitude of this wastage is realized when one considers that, on the basis of a norm of 2,400 working hours a year per person (300 eight-hour working days), this loss of time represents an entire year of work by approximately 58,000 women!

*These range from Emge's[1] figure of 2.8 per cent for primary dysmenorrhea, to Lakeman's[2] statement that 89.6 per cent of industrial workers at some time, in some degree, experience pain during the menstrual period.

†In contrast to this figure, absenteeism from work due to that much publicized timewaster, the common cold, has been estimated, by the most reliable authority available[3], to be on an average, one day (eight hours) a year per worker. Hence, within the group of severe dysmenorrheics, which constitutes one-sixth of the female population of childbearing age in the United States, the economic loss due to menstrual pain is more than three times that resulting from the common cold.

Furthermore, not only the actual absence from work must be taken into account, but one should also consider the innumerable hours lost to inefficiency when a woman is in pain during her menstrual period. This problem is of particular significance today because of the vast numbers of women engaged in our war industry. The possible grave results of a slip along the assembly line due to inattention, while a woman is in pain, need not be elaborated upon. Clearly, it would be a definite advance, both from a medical and from an economic standpoint, to have this great cause of loss of production removed from the factory, especially at this stage of the war effort.

In view of the gravity of this condition, it is not surprising that numerous investigators have devoted their time to this study. Various explanations have been given for the origin of this ailment, and many types of treatment have been resorted to in attempts to relieve it. The factors proposed at one time or another as possible etiologic agents, include mechanical, psychogenic, neurogenic, metabolic, allergic and constitutional ones. On the basis of the work of Ayer[4] and Ussher,[5] Billig[6] emphasized the role of fascia contractions in dysmenorrhea, and suggested stretching exercises to correct this condition.

The system of exercises to be described in the present report has shown beneficial results, particularly in the primary form of this ailment.

Selection of Cases

The group studied consisted of 129 females between the ages of 15 and 37 years. The average age of the patient was 21.6 years, and the average age at menarche was 12.8 years. The subjects of the investigation included patients from the general gynecologic clinic at the Free Hospital for Women, as well as nurses and maids employed by the hospital. The remainder of the group was made up of students from Wellesley, Radcliffe, and Simmons Colleges, and patients from the writer's private practice in San Francisco. On the basis of clinical history, the group, as a whole, was divided into two parts: (1) primary dysmenorrhea, and (2) secondary dysmenorrhea.

Before proceeding further, it would be advisable to define our terms. *Primary* dysmenorrhea presents a fairly definite picture which has been used as a criterion for this study. The pain begins at menarche, or within 3 or 4 years thereafter, in girls of no one particular body build. The discomfort starts several hours to two or three days before the onset of catamenia in the form of cramplike or colicky pains, which are most severe in the lower midabdomen; the pain may radiate down along the thighs or to the lumbosacral region. It is often accompanied by nausea and vomiting, as well as by general malaise, and often a cold and clammy sensation of the hands and feet.

Under *secondary* dysmenorrhea, the writer would classify various other bizarre symptom complexes of which women complain, where pelvic pathology is likewise absent, but where the pains do not conform to the standards set down under primary dysmenorrhea.

We must also establish a criterion as to what is severe pain. Since we base our grading of pain on the word of the patient, the subjective element and psychogenic factors are bound to enter into our evaluation of the pain. If, however, we use the same basis for all the variations, such as pain threshold, neuroses, previous training, etc., these should balance each other. Individuals may vary with respect to their pain threshold,[7] but it is the effect, not the stimulus, that is of consequence to the patient.

Our criteria for grading pain are as follows:

Severe Dysmenorrhea: When the patient is forced to bed during her menstrual period.

Moderate Dysmenorrhea: When the patient is forced to take some medication for relief, but is not confined to bed.

Mild Dysmenorrhea: When the discomfort is not severe enough to warrant medication.

Only those patients complaining of severe dysmenorrhea were included in the series.

Description of Exercises

The exercises, which have been devised for the relief of dysmenorrhea, are very simple to perform; they take less than five minutes a day, and require a minimum of space; they may be done at home, and need be carried out usually for only two or three months before improvement results.

These exercises may best be understood by referring to the charts which show the various positions assumed by the subject:

Position 1.—The patient stands at right angles to the wall at such a distance as will enable her to comfortably rest her left elbow on the wall on a level with her shoulder (Fig. 1*A* and *B*). The pelvis is tilted forward (Fig. 2*A* and *B*), and, while in this position, the patient touches the wall with her hip, keeping her knees straight (Fig. 3). Care must be taken not to twist the body, or allow the elbow to slide up or down along the wall.

Position 2.—The same procedure is repeated using the right elbow.

Position 3.—The patient faces the wall against which she rests both elbows (Fig. 4*A*). The pelvis is tilted (Fig. 4*B*), and the patient stretches until her pelvis touches the wall (Fig. 4*C*). The heels remain on the floor and the knees are kept straight.

Each position is assumed three times, and all are repeated three times a day. If, at the end of two or three months, sufficient relief is obtained, the exercises are discontinued for one or two months. Some patients have no recurrence of pain at catamenia; in others, where relapse occurs, the exercises are performed once daily for one week before the period is due, as a prophylactic measure. The patients were followed for two to twenty cycles after they started doing the exercises, the average being 6.5 cycles.

Results

As shown in Table I, the results are listed under three headings.

Satisfactory relief: Where the patient experienced 75 to 100 per cent relief from her pain and discomfort.

Partial relief: 25 to 75 per cent improvement.

No relief: 0 to 25 per cent improvement.

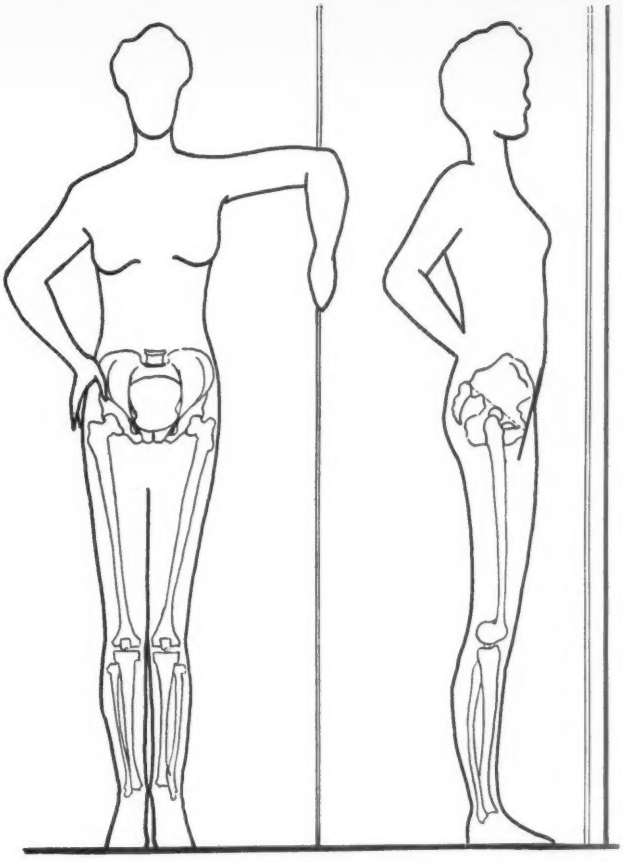
TABLE I

	PRIMARY DYSMENORRHEA		SECONDARY DYSMENORRHEA		TOTAL	
	NO. OF CASES	PER CENT RELIEVED	NO. OF CASES	PER CENT RELIEVED	NO. OF CASES	PER CENT RELIEVED
Satisfactory	64	76.2	31	68.9	95	73.6
Partial	11	13.1	3	6.7	14	10.9
Total	75	89.3	34	75.6	109	84.5
No relief	9	10.7	11	24.4	20	15.5

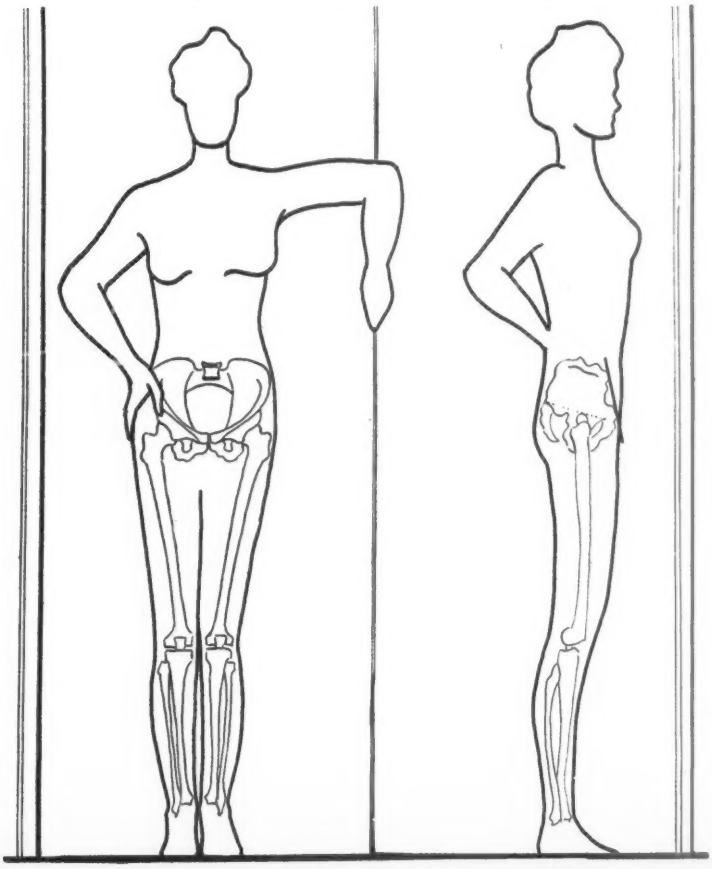
There was at least some degree of relief in nearly 85 per cent of the total series of patients treated. If we consider only those suffering from the primary form of dysmenorrhea, the percentage of relief was 89.3 per cent.

Discussion

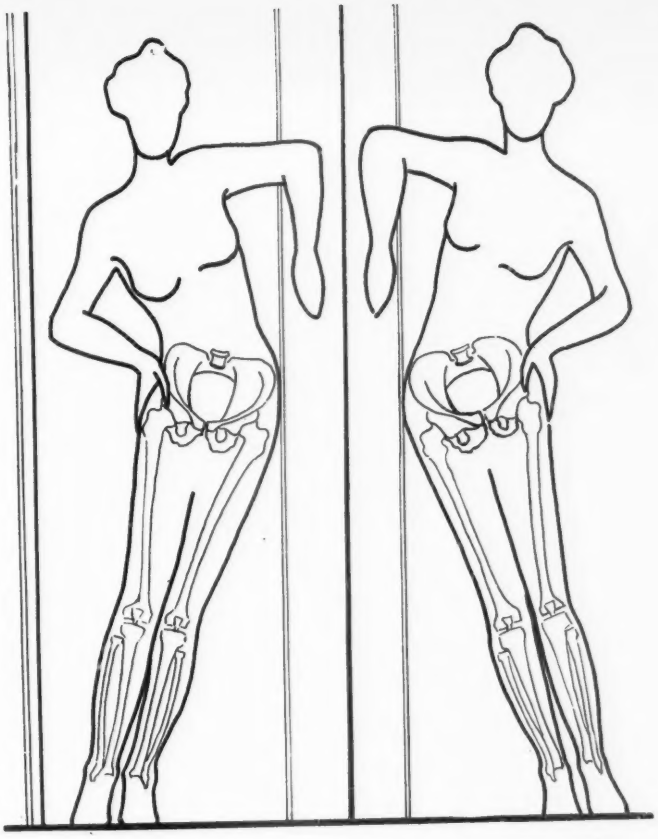
This figure of nearly 90 per cent compares very favorably with the results ascribed to other forms of therapy. These range from 65 per



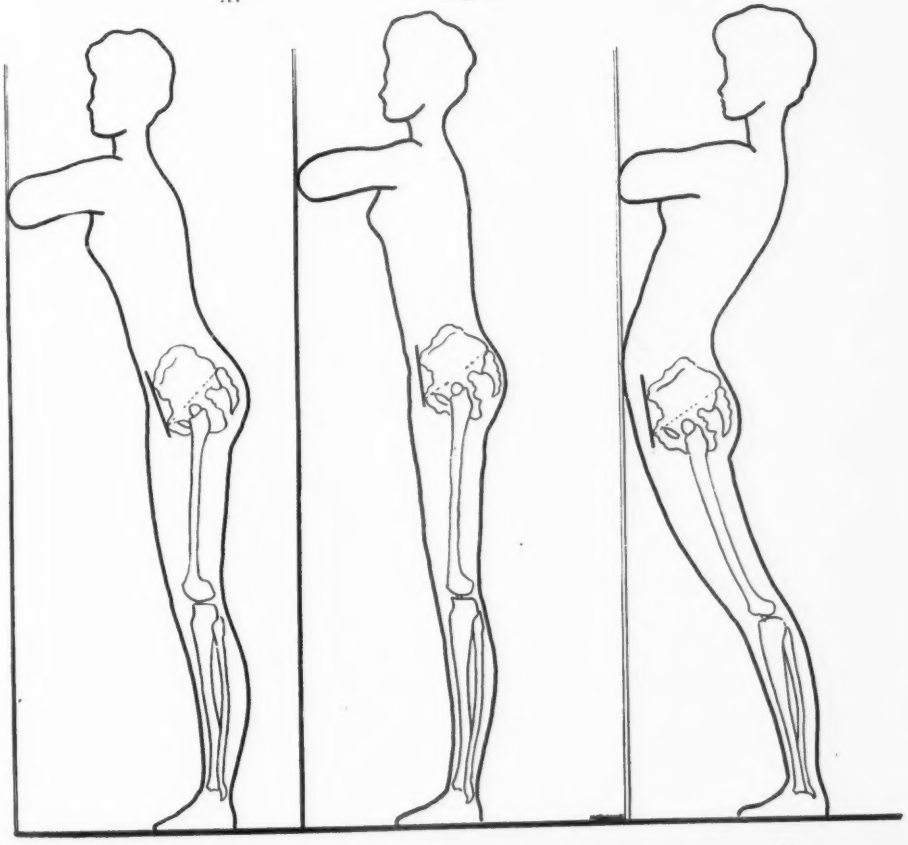
A. Fig. 1. *B.*



A. Fig. 2. *B.*



A. Fig. 3. *B.*



A. *B.* *C.*

Fig. 4.

cent, where benzedrine was reported to constitute the alleviatory agent, to 95 per cent, allegedly achieved by the combination or x-ray and Antuitrin-S.[9] This latter degree of success has also been reported by resorting to psychotherapy.[10] Other measures, reputed to yield intermediate percentages of cure or relief, include the use of hormones,[9, 11-21] dietary regulation,[11, 21, 22] surgical or mechanical procedures,[23-30] and even treatment of allergy.[31-34] Each of these forms of therapy has been claimed by its respective proponent to cure more than half of the cases treated. However, many of the series studied were small, the number of patients ranging from 5 to 60. At present, the word "cure" applied to dysmenorrhea denotes a cure similar to that for diabetes or hyperthyroidism, a substitution therapy. This is unfortunately true of most drugs and hormones that have been used in attempts to alleviate this condition.

Furthermore, in evaluating these percentages of "cure," one should bear in mind the statement of Ehrenfest:[35]

"Reading the immense literature on dysmenorrhea, mostly extolling results with this or that therapy, one cannot fail to be impressed by the tendency of writers to fall into deceptive *post hoc ergo propter hoc* reasoning. Many writers appreciate the important role played by suggestion in the seeming efficacy of any therapeutic measure applied to a woman in a highly nervous and emotional state while suffering pain."

Up to the present time, mechanical methods, such as dilatation of the cervix, presacral resection, or exercises, seem to offer the best and most lasting cures. The exercises described here are much simpler to perform than those reported by previous writers;[36-40] they entail little time and no expense; and in many cases, the beneficial results have lasted for at least twenty months, which was the limit of the follow-up period in this investigation.

Summary

In a group of 129 dysmenorrheics, of whom 84 suffered from primary dysmenorrhea, and 45 from secondary dysmenorrhea, treatment by special exercises was followed by definite relief in 84.5 per cent of the cases. In many instances, the beneficial effect lasted for at least twenty-months, which was the limit of the follow-up period in this investigation. Within the subgroup of those afflicted with primary dysmenorrhea, the percentage of alleviation was 89.3.

My appreciation and thanks to Mrs. Anne McH. Hopkins of Simmons College, Harriet L. Hardy of Radcliffe College, and Elizabeth A. Broyles of Wellesley College for their cooperation in obtaining, examining, and treating students at their respective institutions.

References

1. Emge, L. A.: The Problem of Dysmenorrhea, California & West. Med. **39**: 380-385, 1933.
2. Lakeman, M. R.: Menstrual Pain Among Industrial Women, New England J. Med. **209**: 237-239, 1933.
3. Lanza, A. J.: Incidence and Costs of Acute Respiratory Disease in Industry, J. A. M. A. **116**: 1342-1343, 1941.
4. Ayer, J. B.: Clinical Neurology, New England J. Med. **223**: 376-380, 1940.
5. Ussher, N. T.: The Viscerospinal Syndrome—A New Concept of Visceromotor and Sensory Changes in Relation to Deranged Spinal Structures, Ann. Int. Med. **13**: 2057-2090, 1940.
6. Billig, H. E.: Back Pain and Neuritis, Clin. Med. **48**: 96-99, 1941.
7. Haman, J. O.: Pain Threshold in Dysmenorrhea, AM. J. OBST. & GYNEC. **47**: 686-691, 1944.

8. Larkin, W. J.: A Survey of Dysmenorrhea in a Group of Student Nurses and the Medical Treatment by Means of Benzedrine Sulfate, Pennsylvania M. J. **44**: 994-997, 1941.
9. Kotz, J., and Parker, E.: Primary Dysmenorrhea, An Endocrine Problem, Am. J. Obst. & Gynec. **34**: 38-46, 1937.
10. Johnstone, R. W.: Dysmenorrhea, Edinburgh M. J. **47**: 1-15, 1940.
11. Altschul, A.: The Treatment of Dysmenorrhea With Insulin. (Preliminary Report), J. A. M. A. **106**: 1380-1383, 1936.
12. Campbell, R. E., and Hisaw, F. L.: The Use of Corpus Luteum in the Treatment of Dysmenorrhea, Am. J. Obst. & Gynec. **31**: 508-510, 1936.
13. Elden, C. A., and Wilson, K. M.: The Progesterone Treatment for Dysmenorrhea, Am. J. Obst. & Gynec. **32**: 91-96, 1939.
14. Sturgis, S. H.: The Use of Stilbestrol in the Relief of Essential Dysmenorrhea, New England J. Med. **226**: 371-376, 1942.
15. Hamblen, E. C.: Rationale of Androgenic Therapy in Gynecology, J. Clin. Endocrinol. **1**: 180-186, 1941.
16. Browne, W. H.: The Use of Follutein in Dysmenorrhea, Am. J. Obst. & Gynec. **29**: 113-116, 1935.
17. Goldberg, M. B., and Lisser, H.: On the Clinical Use of Emmenin (Human Placental Extract—Collip), Endocrinology **19**: 649-655, 1935.
18. Rubinstein, H. S., and Abarbanel, A. R.: The Use of Testosterone Propionate in the Treatment of Dysmenorrhea, Am. J. Obst. & Gynec. **37**: 709-715, 1939.
19. Cinberg, B. L.: Androgens in the Treatment of Dysmenorrhea, New York State J. Med. **42**: 2138-2141, 1942.
20. Hirst, D. V., Hamblen, E. C., and Cuyler, W. K.: Rationale of Estrogenic Therapy in Functional Dysmenorrhea, J. Clin. Endocrinol. **2**: 442-446, 1942.
21. Schrick, E. W.: Insulin Treatment of Dysmenorrhea, Am. J. Obst. & Gynec. **37**: 146-147, 1939.
22. Tedstrom, M. K., and Wilson, L. E.: Menstrual Hypoglycemia and Functional Dysmenorrhea: Their Relationship, California & West. Med. **44**: 375-381, 1936.
23. Cannon, D. J.: Modern Theories of Dysmenorrhea, J. Obst. & Gynaec. Brit. Emp. **43**: 492-506, 1936.
24. Weir, W. H.: Results With the Intrauterine Stem Pessary, Am. J. Obst. & Gynec. **33**: 291-299, 1937.
25. Sears, N. P.: The Relation of Ureteral Pain to Menstruation, Am. J. Obst. & Gynec. **37**: 685-689, 1939.
26. Proc. Roy. Soc. Med.: Discussion on Intrinsic Dysmenorrhea **29**: 931-953, 1936.
27. Younge, P.: Personal communication.
28. Shaw, W.: The Treatment of Spasmodic Dysmenorrhea, Lancet **2**: 143, 1933.
29. Sellers, T. B.: Pain Associated With Menstruation, Southern M. J. **25**: 167-175, 1932.
30. Larkin, W. J.: An Office Procedure for the Treatment of Primary Dysmenorrhea, Pennsylvania M. J. **41**: 348-354, 1938.
31. Rowe, A. H.: Uterine Allergy, Am. J. Obst. & Gynec. **24**: 333-338, 1932.
32. Schwarz, O. H., and Smith, D. R.: Essential Dysmenorrhea and Allergy, Am. J. Obst. & Gynec. **33**: 331-336, 1937.
33. Dutta, P. C.: Allergy and Dysmenorrhea, J. Obst. & Gynaec. Brit. Emp. **42**: 309-317, 1935.
34. Duke, W. W.: Allergy, Asthma, Hay Fever, Urticaria and Allied Manifestations, St. Louis, 1926, The C. V. Mosby Co.
35. Ehrenfest, H.: Menstruation and Its Disorders. A Critical Review of the Literature From 1933 to 1936 Inclusive, Am. J. Obst. & Gynec. **34**: 699-729, 1937.
36. Ewing, R. E.: A Study of Dysmenorrhea at the Home Office of the Metropolitan Life Insurance Company, J. Indust. Hyg. **13**: 244-251, 1931.
37. Clow, A. E. S.: Treatment of Dysmenorrhea by Exercise, Brit. M. J. **1**: 4-5, 1932.
38. Bell, M., and Parsons, B.: Dysmenorrhea in College Women, M. Woman's J. **38**: 31-35, 1931.
39. Stevenson, A. D.: The Treatment of Dysmenorrhea, Lancet **2**: 599, 1938.
40. Adams, T. W.: Painful Menstruation. With Especial Reference to Posture as and Etiologic Factor, West. J. Surg. **42**: 88-89, 1934.

490 Post Street

THERAPEUTIC INTERRUPTION OF PREGNANCY

KATHERINE KUDER, M.D., AND WILLIAM F. FINN, M.D.,
NEW YORK, N. Y.

(From the Department of Obstetrics and Gynecology, Cornell University Medical College, and the New York Hospital)

THIS report, which is based upon the experience of The New York Lying-in Hospital from September, 1932, through December, 1943, concerns 280 pregnancies which were interrupted for therapeutic reasons. The vast majority of these, 233 or 83.2 per cent represent what are commonly termed therapeutic abortions, i. e., performed prior to the sixteenth week of pregnancy, but the inclusion of all interruptions prior to viability of the infant, which we have limited to 1,500 grams, broadens our scope. Two hundred and twenty-two, or 79.3 per cent, were clinic patients, while the remaining 58, or 20.7 per cent were performed by private physicians. During this period, 46,861 pregnant women were treated, hence the incidence of therapeutic interruption is 0.6 per cent. On the average, 23.3 interruptions were performed each year.

There were 44 indications for interruption which may be grouped under nine major headings as shown in Table I.

As illustrated, toxemia and cardiac disease accounted for 58.2 per cent, or almost three-fifths of all the interruptions.

TABLE I.—INDICATIONS

GROUP	NUMBER OF CASES	PERCENTAGE
Toxemia	97	34.6
Cardiac disease	66	23.6
Pulmonary disease	31	11.1
Urologic disease	27	9.6
Neurologic and psychiatric disease	16	5.7
Medical diseases	14	5.0
Obstetric complications	10	3.6
Gynecologic complications	10	3.6
Miscellaneous	9	3.2
	280	100.0

TABLE II.—TOXEMIA

TYPE	NUMBER OF CASES
Renal disease	56
Acute glomerulonephritis	4
Hypertensive disease	21
Severe Pre-eclampsia	8
Eclampsia	3
Previous toxemia	5
Total	97

In Table II, it is evident that renal disease was the type of toxemia most frequently encountered. The patients were usually grand multiparas and gave evidence of their disease by persistent albuminuria and impairment of renal function. In the four pregnancies which were complicated by acute nephritis, the pregnancy was interrupted to avoid

strain on the kidneys during this acute phase, and the decision regarding future pregnancies was dependent upon the development of chronic nephritis. Severe pre-eclampsia and eclampsia, as would be expected, led to interruption in the later months of pregnancy. The five cases, in which previous toxemia was the indication, were instances in which no disease was present at the time of interruption, but where the interruption closely followed a pregnancy complicated by severe pre-eclampsia.

All but four of the therapeutic interruptions based on cardiac indications were performed for rheumatic heart disease. The majority of these patients belonged to Class III of the New York Heart Association Classification, while a few were Class IV. Of the remaining four, two were performed because of congenital heart disease, while the other two interruptions occurred in the same individual who had constrictive pericarditis. Twenty-seven of the 31 interrupted on the basis of pulmonary disease were done because of tuberculosis, two were done because of the bronchiectasis, one because of chronic bronchitis, and one because of allergic rhinitis. This last patient already had had two children who had asthma.

Twenty-one interruptions were performed because of pyeloureteritis; sixteen of these were performed during the period from 1932 through 1938, while only five were performed during the second half which ended in 1943. The advent of sulfamilamide and its derivatives has rendered almost unnecessary the interruption of pregnancy because of intractable pyeloureteritis. This is in striking contrast to a decade ago, when pregnancies frequently had to be interrupted, and even despite this, chronic renal infection often resulted. Of the five pregnancies which were interrupted because of pyeloureteritis during the past five years, one of these was complicated by renal tuberculosis and another by sulfanilamide sensitivity. Three of the pregnancies which were interrupted on urological grounds occurred in patients with one kidney —one patient had had a previous nephrectomy for an aneurysm of the right renal artery, and now had hypertension with the blood pressure ranging around 230/110; the second had had a nephrectomy because of renal stone, the third because of renal tuberculosis; these last two patients had infections due to *B. coli* in the remaining kidney.

Six of the fourteen interruptions performed for medical reasons were done because of hyperthyroidism; two of these were performed in the same individual, a girl seventeen years of age, who had had three thyroidectomies in the course of three years. Two were done because of Hodgkin's disease; one was performed because of ulcerative colitis which had resulted in invalidism. Of the sixteen pregnancies which were interrupted for neurologic and psychiatric reasons, nine were performed in patients with psychosis, which was usually manic-depressive in type. While it is not our usual practice to interrupt pregnancies because of epilepsy, three such interruptions were done because of extenuating circumstances. Three interruptions were performed because of far-advanced multiple sclerosis involving the legs and the bladder; patients with less severe grades of multiple sclerosis were permitted to go to term.

Vomiting of pregnancy led to the interruption of seven pregnancies, all of which were performed prior to 1938. Since that time, because of the newer modes of therapy, e.g., intravenous glucose and parenteral vitamins, no pregnancy has had to be interrupted because of vomiting. Previous Watkin's interposition of the uterus led to the termination of two pregnancies, while the presence of ovarian carcinoma caused one pregnancy to be ended. Previous carcinoma, three in the breast and one in the stomach, also caused interruption of pregnancy. Three pregnancies were interrupted because of myomas, and one each because of repeated intrauterine fetal death, vesicovaginal fistula, scoliosis and spondylolisthesis.

Forty-four or 15.7 per cent of the pregnancies terminated were in the Negro race, while 236 or 84.3 per cent were in the white race.

TABLE III.—INDICATION IN THE NEGRO RACE

INDICATION	NUMBER OF CASES	PERCENTAGE
Renal disease	30	68.2
Hypertensive disease	6	13.5
Rheumatic heart disease	3	6.8
Congenital heart disease	1	2.3
Tuberculosis	1	2.3
Pyelonephritis	1	2.3
Severe pre-eclampsia	1	2.3
Myoma	1	2.3
Total	44	100.0

Renal disease is by far the leading reason for termination of pregnancy in the Negro race. Thirty or 53.6 per cent of the 56 patients with renal disease were Negroes, while 26 or 46.4 per cent were white. The Negro race constituted only 15.7 per cent of all the patients, but it represented 53.6 per cent of those with renal disease. From another view point, 68.2 per cent of the pregnancies in the Negro race were terminated because of renal disease, while only 11.2 per cent of the pregnancies in the white race were interrupted for this reason. The low incidence of interruption for tuberculosis and rheumatic heart disease is not because of the low incidence of these diseases in the Negro race, but rather because these patients go to municipal hospitals.

The greatest percentage of interruptions, 151 or 53.8 per cent, occurred in the period of greatest fertility, the decade between 25 and 35 years of age.

TABLE IV.—AGE

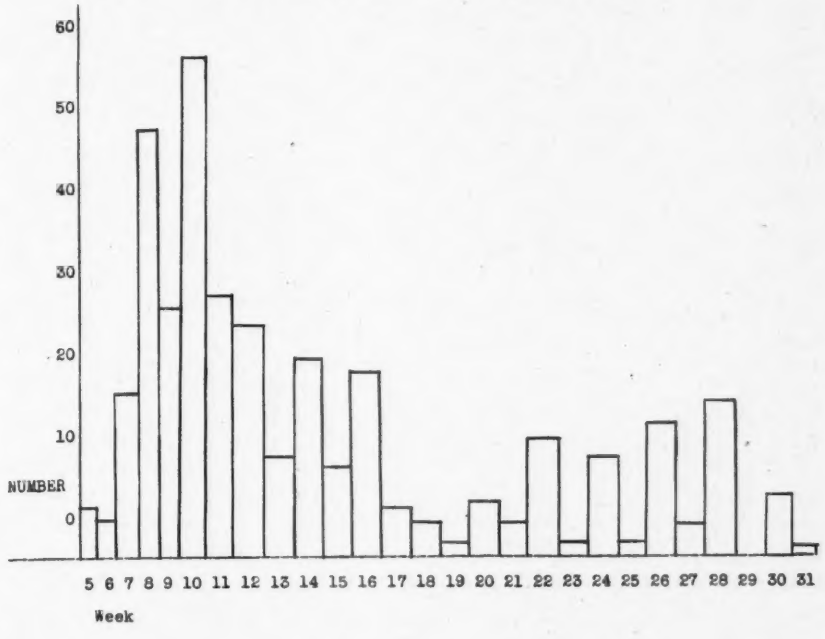
AGE GROUP	NUMBER OF CASES	PERCENTAGE
15 to 19	8	2.8
20 to 24	33	11.5
25 to 29	71	25.3
30 to 34	80	28.5
35 to 39	67	24.5
40 to 44	20	7.1
45 or over	1	0.3
Total	280	100.0

Discussion is required of only two groups, those over 45 and those under 20 years of age. Tuberculosis was the indication for the only pregnancy which was interrupted in a woman over 45 years of age.

In the group under 20, four were interrupted in early pregnancy, one because of rheumatic heart disease, one because of congenital heart disease, and two in the same individual because of hyperthyroidism; the other four were performed in late pregnancy, three for pyelitis and one because of eclampsia.

As is seen in Table V the greatest number of interruptions was in the tenth week as calculated from the last menstrual period.

TABLE V.—WEEK OF INTERRUPTION



Since it is assumed that conception usually occurs about two weeks after the last menses, the actual duration of pregnancy is obtained by subtracting two weeks. Two hundred and thirty-three, or 83.2 per cent of these interruptions were performed prior to the sixteenth week of pregnancy, and hence, constitute what are usually called therapeutic abortions. The remaining 47, or 16.8 per cent were performed after the sixteenth week of pregnancy for pre-eclampsia, eclampsia, pyeloureteritis, hypertensive disease, renal disease and occasionally cardiac disease.

At the time of the therapeutic interruption, 72 or 25.6 per cent of the patients had no living children, 75 or 26.3 per cent had one living child, 41 or 14.7 per cent had three living children, and the remaining 60 or 21.9 per cent had four or more children. Multiparity occasionally bolstered the indication in borderline cases. Grave, indeed, must be the indication which would warrant interruption of a first pregnancy. Table VI, which enumerates the indications for interruption of a first pregnancy, discounts the influence of parity. Interruption in the early weeks of a first pregnancy was usually performed in women who never should have become pregnant; termination in the later months is not so significant, and was usually performed for conditions such as severe pre-eclampsia and pyeloureteritis, which do not contraindicate further childbearing.

TABLE VI.—THERAPEUTIC INTERRUPTION IN THE FIRST PREGNANCY

INDICATION	NUMBER OF CASES	AVERAGE AGE	NEVER PREGNANT AGAIN	SUBSEQUENT COURSE		
				THERAPEUTIC ABORTION	SPONTANEOUS ABORTION	TERM DELIVERY
Tuberculosis	10	27.1	9	0	9	1—3 yr. later
Pyeloureteritis	8	20.5	3	1—3 yr. later	0	1—3, 5, 8 yr. later
					1—2 yr. later	
						1—macerated infant 1 yr. later
						1—3 yr. later
Renal disease	6	23.5	6	0	0	0
Rheumatic heart disease	5	29.0	5	0	0	0
Vomiting	3	28.0	2	0	0	1—2 yr. later
Eclampsia	2	20.5	0	0	0	1—macerated infant 1 yr. later
						1—5 yr. later
Severe pre-eclampsia	2	30.0	2	0	0	0
Myoma	2	31.5	2	0	0	0
Congenital heart disease	2	20.5	1	0	0	1—4 yr. later
Acute glomerulonephritis	2	21.5	1	1—4 yr. later	0	0
Scoliosis	1	27.0	0	0	0	1—3, 6 yr. later
Hypertensive disease	1	22.0	1	0	0	0
Bronchiectasis	1	27.0	1	0	0	0
Premature separation of placenta	1	29.0	0	0	0	1—1 yr. later
Retinitis pigmentosa	1	33.0	1	0	0	0
Multiple sclerosis	1	25.0	1	0	0	0
Hyperthyroidism	1	17.0	0	1—1 yr. later	2—2 yr. later	1—6 yr. later
Number	49		35	3		11
Percentage	100%		71.4%	6.1%		22.5%

The fact that 35 or 71.4 per cent of these patients never became pregnant again shows the imperativeness of interruption. Tuberculosis is first, resulting in 20 per cent of all the interruptions in the first pregnancy. Other diseases which manifest themselves in early life, such as congenital heart disease and acute glomerulonephritis, are also present.

When so serious a decision as the interruption of pregnancy is reached, the question arises whether pregnancies had ever been previously forbidden by a physician. In 100 or 35.7 per cent of our patients, pregnancy had been previously interdicted; in 78 or 27.9 per cent, it had not been forbidden, while in 102 or 36.4 per cent, no information is available. Sterilization had been performed in three of the cases in which pregnancy had occurred after its interdiction. This had been done by three different methods: (1) electrocoagulation of the tubes, (2) tubal resection by a vaginal route at the time of an interposition operation and, (3) abdominal tubal resection.

As is illustrated in Table VII, the majority of these interruptions were performed by the vaginal route.

The duration of pregnancy is the prime factor in the determination

TABLE VII.—METHOD OF INTERRUPTION

METHOD	NUMBER OF CASES		PERCENTAGE
Vaginal Operation	204	72.8	
One stage (dilatation and curettage)			
Without sterilization	108		38.5
With sterilization	27		9.7
Two stage (preliminary packing of cervix and curettage next day)			
Without sterilization	46		16.4
With sterilization	3		1.0
Hysterotomy	4		1.4
Bougie	1		0.3
Voorhees' bag	15		5.5
Abdominal Operation	76	27.2	
Without sterilization, hysterotomy	8		2.9
With sterilization, hysterectomy	19		6.8
Hysterectomy plus unilateral salpingo-oophorectomy	3		1.0
Hysterectomy plus bilateral salpingo-oophorectomy	1		0.3
Hysterotomy plus tubal sterilization	45		16.2
Total	280	100.0	

of the route of interruption. Occasionally, however, the intention of the operator to effectively end all childbearing leads to an hysterotomy and tubal ligation. Table VII is self-explanatory except in the instances where sterilization was not done though the pregnancy was terminated by an abdominal route, and the case in which both ovaries were removed in a young woman. The latter was done because of bilateral papillary serous cystadenocarcinoma. In the former eight cases, sterilization was not done in five patients in whom future childbearing was to be permitted (two patients with vomiting, two with severe pre-eclampsia and one with premature separation of the placenta); in two instances, in which legal involvements arising from illegitimacy were present; and in one case, in which sterilization was refused by the patient.

As illustrated in Table VIII, sterilization was performed in 98 cases or 35 per cent; 30 of these were done simultaneously with or shortly after a curettage, while 68 were performed at the time of laparotomy. In the majority of cases in which pregnancy was terminated, further childbearing was interdicted either temporarily or permanently.

TABLE VIII.—ATTITUDE TOWARD FUTURE PREGNANCIES

RECOMMENDATION	NUMBER OF CASES		PERCENTAGE	
Pregnancy interdicted	211		75.3	
Contraception		113		40.3
Sterilization (tubal ligation 72, hysterectomy 26)		98		35.0
Pregnancy not interdicted	11		3.9	
No preventive measures	7		2.6	
Unknown	51		18.2	
Total	280		100.0	

In Table VIII, future pregnancies were not interdicted in 11 patients —five of these had vomiting of pregnancy, two of these were unmarried, and one each had premature separation of the placenta, pyeloureteritis, severe pre-eclampsia and myasthenia gravis. Of the seven patients in whom no preventive measures were taken, three left the hospital against

advice, two refused sterilization or contraceptive advice, one died and one returned to her own physician. The group of which we are uncertain was largely composed of private patients, a large number of whom were undoubtedly given contraceptive advice later by their physician, though there is no mention of this in the record of their hospital stay. An analysis of the prevention of future childbearing reveals the fact that previous failure of contraception leads to sterilization after subsequent abortions and pregnancies.

The choice of anesthesia was influenced primarily, by the indication for operation (patients with pulmonary or cardiac complications usually receiving local anesthesia), and secondarily, by the preference of the surgeon.

TABLE IX.—ANESTHESIA

TYPE	NUMBER OF CASES	PERCENTAGE
Total Inhalation	157	56.0
Nitrous oxide and ether (95)		
Ether by open drop (30)		
Nitrous oxide (24)		
Cyclopropane (7)		
Ethylene (1)		
Basal—Local	102	36.4
Avertin and Nitrous Oxide	21	7.6
Total	280	100.0

In 13 or 6.4 per cent of the 204 pregnancies which were interrupted by a vaginal operation, the pregnancy was not terminated by the curettage; five expelled the fetus and one expelled part of the placenta subsequently, while in the remaining seven, a second curettage was necessary at intervals varying from two to eight weeks, and in each case degenerated decidua was obtained. In the five instances in which the fetus was expelled after the curettage, this occurred once on the first day, twice on the second day, once on the fourteenth day and once on the nineteenth day. In three instances or 1.5 per cent, the uterus was ruptured and a subtotal hysterectomy had to be performed. Only one bicornuate uterus was encountered, and in this patient, a cornual resection was done. Two ectopic pregnancies were found. In the first case, a left interstitial pregnancy was found during the performance of a sterilization eight days after the initial curettage. In the second instance, a left tubal pregnancy was found at a laparotomy performed because the curettage had shown only decidua and no chorionic elements.

Of the 204 patients who had a vaginal operation, 144 were afebrile, 25 had one day of fever, 26 had two or more days of fever due to intrauterine infection, while nine had two or more days of fever due to extrauterine causes. Nineteen of the 76 patients, who had laparotomies were afebrile, 23 had one day of fever, and the remaining 34 had two or more days of fever. In the group of vaginal cases with fever, a number of the patients also had an abdominal sterilization after the curettage, and hence, it is difficult to determine whether the fever is due to the vaginal manipulation, or to the laparotomy. There were no deaths as a result of infection in our series.

TABLE X.—SUBSEQUENT PREGNANCIES

A—Allowed to Continue

CASE	TIME INTERVAL SINCE THERAPEUTIC ABORTION		CONTRACEPTION PREVIOUSLY ADVISED	FUTURE CHILDBEARING PERMANENTLY FORBIDDEN	COURSE		
	YR.	MO.			PREMATURE OR TERM DELIVERY	SPONTANEOUS ABORTION	STERILIZATION
1. Renal disease	1	0	Yes	Yes	+		+
2. Severe pre-eclampsia	4	0	No	No	+		
	6	0	No	No	+		
3. Severe pre-eclampsia	2	6	No	No	+		
4. Rheumatic heart disease	1	2	Yes	Yes	+		
	2	9	Yes	Yes	+		+
5. Congenital heart disease					+		
	3	3	No	?	+		+
6. Pulmonary tuberculosis	3	6	Yes	Temporary (2 yr.)	+		
7. Pulmonary tuberculosis	0	9	Yes	?		+	
	4	0	Yes	?	+		
8. Pyeloureteritis	2	2	Yes	No	+		
9. Pyeloureteritis	4	0	No	No		+	
	7	0	No	No	Dead macerated infant		
10. Pyeloureteritis	3	0	Yes	Yes	+		+
11. Pyeloureteritis	0	9	Yes	Yes	+		
12. Pyeloureteritis	3	0	?	No	+		
	5	0	No	No	+		
	9	0	No	No	+		
13. Pyeloureteritis	3	0	Yes	Temporary (1 yr.)	+		
	6	0	No	No	+		
14. Hydronephrosis	3	6	Yes	Yes	+		+
15. Hyperthyroidism	2	9	Yes	Temporary (1½ yr.)	+		
16. Hyperthyroidism	5	6	Yes	No	+		
17. Premature separation of placenta	1	6	No	No	+		
18. Scoliosis	3	0	Yes	No	+		
	6	0	No	No	+		+
19. Pregnancies in too close proximity	3	0	?	No	+		
Average time	3	8					

B.—Not Allowed to Continue

CASE	INDICATION	TIME SINCE LAST INTERRUPTION		METHOD OF PREVENTION		
				PRIOR TO INTERRUPTION	AFTER INTERRUPTION	
		YEAR	MONTH	CONTRACEPTION	CONTRACEPTION	STERILIZATION
I. Done Here						
20.	Renal disease	0	10	+	+	
21.	Renal disease	1	3	+		+
22.	Renal disease	3	0	+		Refused
23.	Hypertensive disease	2	0	+		+
24.	Rheumatic heart disease	0	10	+	+	
25.	Constrictive pericarditis	0	8	+	+	
26.	Pyeloureteritis	3	0	?	+	
27.	Pyeloureteritis	3	0	+		+
28.	Psychosis	0	9	+	?	
29.	Hyperthyroidism	0	5	+	+	
II. Done Elsewhere						
30.	Acute glomerulonephritis	1	3	+	?	
	Average time	1	6			

What is the obstetric history of patients after the interruption of a pregnancy? A partial answer is given in Table X.

In Table X, *A*, are represented 27 pregnancies, which occurred in 19 individuals. Five of these pregnancies were in four patients in whom the intention at the time of the therapeutic interruption was to end childbearing permanently; four of these individuals were subsequently sterilized. The remaining 22 pregnancies occurred in fifteen individuals in whom, despite the interruption of one pregnancy, it was thought that future pregnancies might be permitted. In the 38 pregnancies which followed therapeutic interruptions of pregnancy, 23 living children were born, two spontaneous abortions occurred, one macerated infant and one premature infant who died shortly after birth were delivered, and 11 pregnancies, as shown in Table X, *B*, were interrupted for the second time. Hence, eleven or 3.9 per cent of the patients who had a previous therapeutic interruption here required a second termination of pregnancy. In addition, as illustrated in Table XI, 12 other patients, who had had a therapeutic interruption elsewhere, and three who had had two therapeutic interruptions elsewhere, required another termination of pregnancy for therapeutic reasons.

TABLE XI.—REPEAT THERAPEUTIC INTERRUPTIONS
(Only the last done at New York Hospital)

CASE	INDICATION	TIME SINCE LAST INTERRUPTION		PREVENTION OF PREGNANCY		REMARKS
				PRIOR TO INTERRUPTION	AFTER INTERRUPTION	
		YR.	MO.			
1.	Renal disease	2	0	?	Contraception	
2.	Renal disease	3	0	?	?	
3.	Renal disease	6	0	?	Hysterectomy	
4.	Rheumatic heart disease	6	0	?	?	
5.	Rheumatic heart disease	1	0	?	?	
6.	Rheumatic heart disease	7	0	Contraception	Sterilization	
7.	Rheumatic heart disease	4	0	Contraception	Sterilization	
8.	Rheumatic heart disease	5	0	?	?	
	Rheumatic heart disease	3	0	?	?	3rd Therapeutic interruption
9.	Tuberculosis	3	0	?	?	
	Tuberculosis	2	0	?	?	3rd Therapeutic interruption
10.	Tuberculosis	0	3	?	Sterilization	
11.	Tuberculosis	4	0	?	Contraception	
12.	Chronic bronchitis	9	0	?	?	
13.	Psychosis	13	0	?	?	
14.	Vomiting	1	0	?	?	
15.	Vomiting	11	0	Contraception	Contraception	
	Vomiting	3	0	Contraception	?	3rd Therapeutic interruption

Tables X, *B* and XI show that 23 of our patients required a second therapeutic interruption, while three needed a third. In all, 29 repeat therapeutic interruptions were performed in 26 patients, an incidence of 10 per cent. The shortest time interval between the therapeutic interruptions was three months, the longest was 13 years, while the average was three and one-half years.

Frequently, the decision to interrupt a pregnancy can be reached only after grave deliberation. There is no question, however, but that the termination of a pregnancy is justifiable when the patient subsequently dies of the disease, which was the indication for the interruption. As illustrated in Table XII, there were thirteen such patients in this series. The majority of these were included in the earlier half of the study, 1932 to 1938, and hence, have been followed longer than those whose pregnancies were interrupted during 1938 through 1943.

TABLE XII.—DEATHS

CASE	INDICATION FOR INTERRUPTION	TIME SINCE THERAPEUTIC INTERRUPTION YR.	MO.	CAUSE OF DEATH	POST MORTEM
	I. Cause of Death Same as the Indication for Therapeutic Interruption				
1.	Renal disease	0	3	Uremia	Not obtained
2.	Renal disease	0	11	Uremia	Not obtained
3.	Renal disease	2	2	B.P. was 260/160, N.P.N. was 91, two weeks prior to sudden death at home.	Not obtained
4.	Renal disease	2	3	Sudden death	Not obtained
5.	Renal disease	2	4	Sudden death	Not obtained
6.	Renal disease	3	4	B.P. was 225/150, vision poor, urea clearance 10%, two months prior to sudden death.	Not obtained
7.	Rheumatic heart disease		10 days	III C. Embolism of both iliac arteries with gangrene of left leg.	Not obtained
8.	Rheumatic heart disease		21 days	Decompensation and fibrillation.	Mural thrombus of left auricle and renal infarcts.
9.	Rheumatic heart disease	7	3	Class III C. Fibrillation	Endocarditis
10.	Rheumatic heart disease	7	5	Class III C. Recurrent decompensation for 9 years.	Not obtained
11.	Multiple sclerosis	0	4	Incontinent, could not stand.	Not obtained
12.	Hodgkin's disease	1	3	Dyspnea due to lung infiltration	Involvement of lungs, liver, diaphragm, jejunum
13.	Breast carcinoma	0	3	Recurrence over left clavicle and lung metastases.	Not obtained
	II. Cause of Death Not the Same as the Indication for Therapeutic Interruption				
14.	Renal disease	1	0	Diabetic coma (uremia excluded).	Not obtained
15.	Polycystic kidneys	11	6	Pneumonia due to Type II pneumococcus.	Not obtained
16.	Vomiting of pregnancy	3	8	Hypernephroma	Not obtained

The only postoperative deaths in the series (Cases 7 and 8) occurred in patients with cardiac disease, one of whom died of heart failure, while the other died of bilateral embolism of the lower extremities. Of the thirteen patients who died of the disease which was the indication for the therapeutic interruption, six or almost half had renal disease.

Summary and Conclusions

1. From September, 1932, to December, 1943, there were 280 interruptions of pregnancy for therapeutic indications at the New York Lying-in Hospital. During this period, 46,861 pregnant women were cared for, thus the incidence of interruption was 0.6 per cent.

2. Toxemia and cardiac disease accounted for 58.3 per cent of the interruptions.

3. Because of newer modes of therapy, interruption of pregnancy is rarely necessary now in pyeloureteritis and in vomiting of pregnancy.

4. Forty-four or 15.7 per cent were performed in the Negro race. Renal disease accounted for 68.2 per cent of all the interruptions in the Negro race, while it was the indication for only 11.2 per cent of the interruptions in the white race.

5. The average age was 25 to 35. Eight or 2.8 per cent of the interruptions were performed in women under 20 years of age.

6. The greatest number, 124 or 44.3 per cent, were performed in the eighth to the tenth week.

7. At the time of interruption, 72 or 25.6 per cent of the patients had no living children, 75 or 26.3 per cent had one living child, while the remaining 133 or 48.1 per cent had two or more children.

8. Forty-nine or 17.8 per cent of the interruptions were performed in the first pregnancy; 35 of these women never became pregnant again, three had a second therapeutic interruption, while 11 had subsequent pregnancies.

9. Pregnancy had been previously interdicted in 100 or 35.7 per cent. Subsequent pregnancy occurred three times after previous sterilization, two of which had been done elsewhere.

10. Two hundred and four, or 72.8 per cent of these pregnancies were terminated by the vaginal route, while a laparotomy was performed in 76 or 27.2 per cent.

11. Tubal sterilization was performed in 98 or 35 per cent, while 113 or 40.3 per cent were given contraceptive advice.

12. Thirteen or 6.4 per cent of the interruptions which were performed by the vaginal route were incomplete, and rupture of the uterus occurred in three cases or 1.5 per cent.

13. One hundred and fifty-seven or 56 per cent of these operations were performed under inhalation anesthesia, 102 or 36.4 per cent were performed under basal and local anesthetics, while 21 or 7.6 per cent received avertin anesthesia.

14. Two or more days of fever occurred in 60 or 21.6 per cent, while 163 or 58.2 per cent were afebrile.

15. Thirty-eight pregnancies occurred in 30 women after a previous pregnancy had been interrupted for therapeutic reasons; eleven of

these were terminated for the second time, while two spontaneous abortions and 25 deliveries occurred.

16. Eleven or 3.9 per cent of the patients who had had a therapeutic termination at the New York Hospital required an interruption in a subsequent pregnancy. When we include those who had their first therapeutic interruption elsewhere, 29 repeat terminations of pregnancies were done in 26 patients, the incidence thus being 10 per cent.

17. There were sixteen deaths; two of these occurred in the postoperative period. Thirteen were due to the disease which was the indication for the therapeutic interruption, while three were due to other causes.

PREGNANCY IN A RUDIMENTARY HORN OF THE UTERUS

FREDERICK W. MULSOW, M.D., PH.D., CEDAR RAPIDS, IOWA

PREGNANCY of a rudimentary horn of the uterus is rare. A review of the literature indicates that case reports are less frequent in recent years. The serious nature and rarity of this condition, and the circumstance under which the present case was found, appear sufficient reasons for the case report and brief review of the literature.

Williams Obstetrics[1] makes the following statements concerning this: "In 78 per cent of 84 cases collected from the literature by Keherer in 1900, the proximal end of the rudimentary horn did not communicate with the uterine cavity, so that in them pregnancy must have followed external migration of the spermatozoa or of the fertilized ovum. Rupture often occurs in the first 4 months and may lead to death from intraperitoneal hemorrhage. This result was noted in 87, 47.6 and 5.5 per cent of the cases collected by Sanger, Keherer, and Beckmann, respectively, in 1884, 1900 and 1911." In *Principles and Practice of Obstetrics,* DeLee[2] makes the following comment: "Mauriceau and Vassal in 1669 recorded the first case, and now over 100 have been described." Curtis[3] in his textbook says: "Bicornate uterus with one or the other rudimentary and partially hollow is said to be a common form." Davis[4] says that "pregnancy in a rudimentary horn is an exceedingly rare condition."

After reading these statements, one is impressed with the fact that a recent review of this condition has not appeared, and only a few case reports are noted in American literature. It seems that the mortality in the early case reports was high, and they were, therefore, reported. In recent years, improved surgical measures have reduced the mortality and apparently the number of case reports. The diagnosis is usually made at the time of operation or at autopsy, as occurred in the present case report.

With the aid of the librarian of the Iowa State Medical Library at Des Moines, I have been able to review the records of 9 case reports, which have been reported since Beckmann's review in 1911. The present review is given in tabular form, and includes only a few remarks concerning the most interesting points in each. There were no deaths among these 9 case reports, but there were many complications and a few near deaths. There was a microscopic lumen between the rudimentary horn and the cavity of the uterus in only two of these. (Table I.)

TABLE I. REPORTS OF PREGNANCY IN RUDIMENTARY HORN OF THE UTERUS

AUTHOR	AGE AND SITE	REMARKS
Scott, E., and Forman, J.: AM. J. OBST. 73: 470, 1916.	45, Right side Full-term twins.	Cramps for 2 weeks at term. No more cramps or life felt. Had 2 babies before this, two shortly afterward, then 3 miscarriages, and 9 years later a baby. At operation for mass present 20 years found bones of twins in the rudimentary horn.
Lahman, A. H., Kilkenney, G. S., and Mietus, A. C.: AM. J. OBST. & GYNEC. 42: 534, 1941.	26, Right side. Full-term twins. Small canal with uterus.	Uterus small at term. Friedman positive and waited 6 weeks. No more fetal motions. Negative Friedman, positive x-ray. At operation macerated twin females in rudimentary horn.
Humpstone, C. P.: Surg., Gynec. & Obst. 31: 505, 1920.	30, Left side. Ruptured at 4 months.	Sudden severe pain. At operation for ectopic pregnancy, ruptured pregnant rudimentary horn of uterus found.
Ibid.: Case II.	21, Right side. 8th month.	Eclampsia at 8 months. Attempted vaginal section failed and removal of uterus with rudimentary horn made a difficult operation.
D'Arcy, C. E.: M. J. Australia 2: 373, 1925.	35, Left side. Full term.	Few pains and bleeding at term. Became ill 3 weeks later with fever and vomiting. Large left pregnant and small right rudimentary horn found at operation.
Stabler, F.: Newcastle M. J. 2: 117, 1931.	Age not given. Left side. 8th month.	Two previous premature births. Pains began at 8th month. Medical induction of labor failed. Normal pregnancy 2 years later, and could not deliver previous fetus. Operation 2 months later found pregnant rudimentary horn.
Nokes, J. M.: AM. J. OBST. & GYNEC. 28: 250, 1934.	19, Left side. 6 months.	Abortionist tried to interrupt pregnancy at 5 months and again at 6 months but failed, fetus killed. At operation 2 months later, found true condition.
Rutherford, R., and Morgan, J.: Lancet 2: 1337, 1934	35, Right side. Full term.	False labor at term with death of fetus. Induction of labor failed, sepsis developed and patient survived difficult operation on rudimentary horn pregnancy.
Guerrant, E.: S. Clin. North America 15: 537, 1935.	33, Right side. 5th month. Small lumen to uterus.	Normal pregnancy to 5th month, when slight bleeding occurred. Friedman test negative. Author thinks she is lucky to be alive after so long delayed operation.
Present case	31, Left side. 5th month.	Sudden death at 4½ months.

Case Report

Mrs. L. G., aged 31, married 5 years, had been pregnant about 4½ months, and had been seen last by her physician about 6 weeks previously. The county attorney of a neighboring county about 60 miles distant called me one evening and asked if I would come there and make the necessary postmortem examinations in a death that had occurred there under suspicious circumstances. On account of the medicolegal aspects of the case and gas rationing, this request was refused. Later that night he called again and agreed to bring the body to Cedar Rapids. As county coroner's pathologist of my own county, I felt somewhat obligated to help clear up the cause of death in this case, and arranged to make the necessary examinations the next day.

The woman living in a "trailer house," had enjoyed good health during her pregnancy and had last seen her physician 6 weeks previously at 3 months. On this particular morning, she did not feel well and asked her husband to stop the radio program, while he went out to do some morning chores. When he returned 15 minutes later, he found

her dead in bed. He called in a neighbor, who called a funeral director. He asked who her physician was and found that she had not seen a physician during the last six weeks. The county coroner and county attorney were not satisfied with this story and ordered an inquest and an autopsy.

The necropsy revealed that her death was due to intraperitoneal hemorrhage. There was slightly more than 2 liters of blood clots and bloody fluid in the abdominal cavity. A male fetus 19 cm. long and weighing 178 grams was found in its sac, and the placenta was attached to what was at first thought to be a ruptured Fallopian tube, but which upon further investigation, proved to be a rudimentary horn of the uterus.

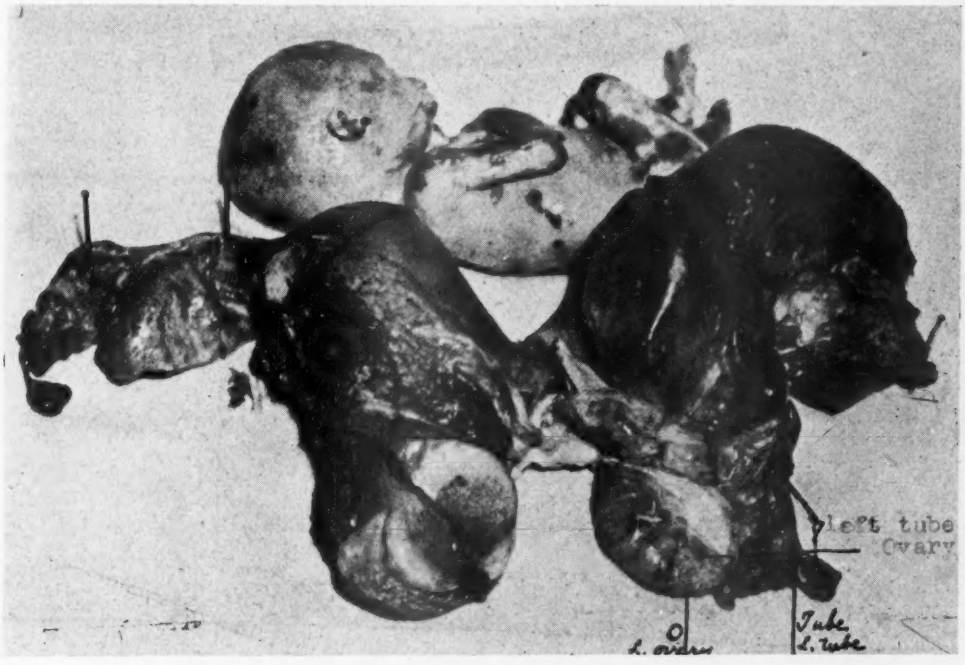


Fig. 1.—Uterus with left rudimentary horn ruptured, and ovary and tube attached. Right ovary and Fallopian tube in normal position.

Autopsy Report.—The uterus is 12 cm. long. The rudimentary horn is ruptured and the fetus and part of the placenta have escaped into the abdominal cavity. The rudimentary horn is 12 cm. long by about 8 cm. across. It is attached to the lower left side of the uterus by a pedicle about 15 mm. across. Microscopic sections of this base of the rudimentary horn failed to reveal any lumen connecting the cavity of the rudimentary horn with the cavity of the uterus. The right tube and ovary are in the normal position. The left ovary is 6 by 4 cm. by 1 to 2 cm. thick. It contains a corpus luteum 15 mm. across. The left Fallopian tube is 10 cm. long by 4 to 7 mm. across. It opens into the base of the rudimentary horn. The relations between the rudimentary horn and the uterus and ovaries are shown in Fig. 1.

Comment

Any one obstetrician probably will see not more than one case of this kind and many have not seen one in many years of practice. A rudimentary horn of the uterus may be found more often by surgeons and gynecologists, who by its timely removal, may prevent sudden death later or difficult obstetric conditions.

It has been estimated from textbooks that 90 per cent of rudimentary horn pregnancies rupture about the fourth month, and may result in sudden death from intraperitoneal hemorrhage. The remaining 10

per cent may go to term and cause considerable trouble and result in the death of the fetus. In the present review, four of nine cases reported went to term. The cases reported in recent years have been the cause of considerable surgical and diagnostic difficulties, and the authors have reported them for the benefit of others. One was left in place for 20 years, and another for 2 years, before the diagnosis was made. An abortionist failed in two attempts to deliver the fetus. Twins occurred in two instances.

Summary

The sudden death of a woman in the fifth month of pregnancy, due to the rupture of a pregnant rudimentary horn of the uterus, is reported. This report with a brief review of recent American and English literature is given to call attention of gynecologists and obstetricians to the dangers and complications of this condition.

References

1. Stander, H. J.: Williams Obstetrics, New York, 1941, D. Appleton-Century Co., p. 709.
2. DeLee, J. B., and Greenhill, J. P.: Principles and Practice of Obstetrics, Philadelphia, 1943, W. B. Saunders Co., p. 532.
3. Curtis, A. H.: Obstetrics and Gynecology, Philadelphia, 1934, W. B. Saunders Co., Vol. III, p. 664.
4. Davis, C. H.: Gynecology and Obstetrics, Hagerstown, Md., 1935, W. E. Prior Co., Vol. I, Chapt. 14, p. 5.

POSTOPERATIVE VESICO-UTERINE FISTULA

ROBERT T. FRANK, A.M., M.D., NEW YORK, N. Y.

MRS. M. B., aged 47 years, was referred to me for vesicovaginal fistula with total leakage of urine.

The history was that in October, 1943, a curettage, high amputation of the cervix, and anterior and posterior colporrhaphy had been performed for rectocystocele and first degree prolapse. The day following operation it was noted that all urine escaped from the vagina.

I saw the patient five months after the original plastic operation had been performed. The repair of the prolapse was excellent. The introitus was small, good perineum, no cystocele, the uterus high, anteflexed, cervix amputation flush with the vault. A steady stream of urine oozed from the external os.

A metal catheter through the urethra showed the bladder empty and contracted. A probe passed through the external os eventually was maneuvered through the fistula, 2 inches above the vaginal vault (cervix amputated), and then came into direct contact with the catheter in the bladder.

I considered it unjustified to plug and shut off the vagina with a rubber bag and then to distend the bladder in order to visualize the site of the fistula through a cystoscope. This procedure might have forced fluid through the Fallopian tubes into the peritoneal cavity.

At operation, one week later, it was found that the uterus would not budge or descend on volsellar traction. The cervix was fixed fairly close to the symphysis pubis. A deep Schuchardt incision extending to the cervix was made on the left side. An inverted T-incision through the mucosa of the short anterior vaginal wall, hugging the anterior wall of the uterus closely, was made. By sharp dissection the separation was

tunneled upward, the tissues proving semicartilagenous in consistency. A transverse tear into the bladder was made, by accident, immediately behind and below the internal urethral meatus. Painfully and slowly the dissection was carried upward, never obtaining a tunnel more than 1½ inches wide until, at 2 inches above the cervix, as the probe had shown, bladder and corpus were fused in the midline. This area was almost inaccessible. With a scalpel a thin ovoid area was cut out of the anterior wall of the uterus. The fistula was situated in the center of this uterine patch. With great difficulty two sutures of No. 0 chromic catgut were passed through the bladder muscle and fascia as well as through the patch, thus adequately inverting the bladder defect. The uterine end of the fistula was disregarded. Next, the transverse hole in the bladder, which had been made during my approach, was closed with interrupted catgut sutures, and the vaginal mucosa approximated without drainage. A permanent mushroom catheter was inserted into the bladder. Finally, the Schuchardt incision was closed. The patient made an uneventful recovery, was discharged on the sixteenth day with full continence and control.

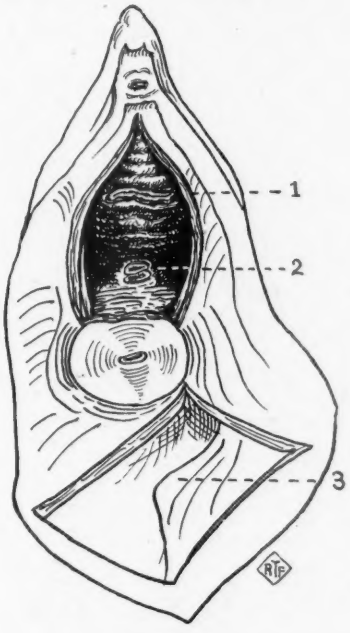


Fig. 1.

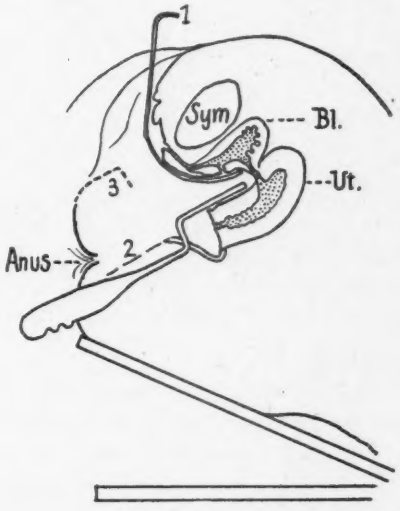


Fig. 2.

Fig. 1.—Operative exposure of fistula. Bladder and uterus separated. *1*, Tear into bladder resulting during liberation. *2*, Vesical and uterine openings of fistula after cutting across fistulous tract. *3*, Schuchardt incision.

Fig. 2.—Diagrammatic sagittal section of pelvis. The vesicovaginal septum has been entered by means of sharp dissection up to the fistulous tract. *1*, Ribbon retractor anteriorly. *2*, Schuchardt incision. *3*, High perineal body before operation which was restored as a final step in the procedure.

Comment.—The possibility of injuring the bladder arises whenever this viscus is separated from the uterus, either from below or above. The danger is minimized by keeping close to the uterus and finding the loose layer of areolar tissue which binds uterus and bladder to each other. If the bladder has been injured, it must be repaired at once and kept at rest and contracted by means of a permanent catheter for from eight to ten days. Less avoidable is necrosis, due to ischemia following radical hysterectomy in which branches of the vesical arteries have been tied. Drainage gauze must not touch the bladder; rubber dam, on the other hand, rarely if ever, causes necrosis. This case is reported because of the unusual technical difficulties resulting from antecedent plastic repair.

CARCINOMA FOLLOWING PREGNANCY WITH SPONTANEOUS CURE

WILLIAM LEVINE, M.D., F.A.C.S., AND SAMUEL WEINER, M.D.,
BROOKLYN, N. Y.

(From the Department of Obstetrics and Gynecology, Beth El Hospital)

DIFFUSE carcinoma of the peritoneum and mesentery is generally metastatic. It is usually inoperable because of its extensive spread and involvement of adjacent organs. Occasionally deep x-ray therapy yields palliative relief, but actual elimination of the lesion and complete recovery are rare. Ewing states that there has been no case of spontaneous cure of carcinoma reported in medical literature. An instance in which intraperitoneal carcinoma was found at operation, and found absent on later laparotomy and biopsy, is of unusual interest.

G. M., a 34-year-old primipara was delivered spontaneously after a short labor, on Nov. 22, 1939. Her pregnancy had been normal in every respect. Her previous medical history was negative except for an appendectomy in 1932. Her immediate postpartum course was uneventful, and she was discharged from the hospital on the tenth day.

Soon after her discharge from the hospital she began to complain of colicky pains in the upper abdomen, weakness, fatigue, epigastric fullness, nausea and vomiting, anorexia, frequency of urination, and loss of weight. These symptoms became gradually worse, and on repeated examinations the only physical finding was a small, tender pedunculated fibroid attached posteriorly to the uterus. She was advised to remain under observation because of the above symptoms and findings. She was seen again three and a half months later, still complaining of the above symptoms. In addition to the pelvic findings described above, there was a large, tender, fixed mass in the midabdomen, not connected with the pelvic tumor. The liver was also enlarged and tender.

X-ray study of the gastrointestinal tract at that time revealed no evidence of gastric or duodenal ulcer or a new growth. A mass density in the right upper quadrant, which was extracolic and extrarenal, was suggested.

She was admitted to the hospital four months post partum, and upon laparotomy it was found that there was free hemorrhagic fluid in the peritoneal cavity. The liver was enlarged and nodular and the seat of numerous metastatic nodules. There were multiple implants on the peritoneum and in the omentum. There was also a large, firm mass involving the gastrocolic omentum and the transverse colon. It was not possible to say whether this mass arose from the lumen of the gut. The uterus was the seat of two pedunculated fibroids, and both ovaries were studded with peritoneal implants. Several implants were taken for biopsy. An attempt was made to take a liver biopsy, but was abandoned because of extensive friability and marked bleeding.

Microscopic sections revealed lymph nodal tissue replaced by masses of atypical and hypertrophied tall cuboidal or polygonal epithelial cells which in places form suggestions of glands, and occasionally contained small mucuslike globules. These cells had large hyperchromatic vesicular nuclei and mitotic figures of both regular and irregular types. Pathologic diagnosis was metastatic adenocarcinoma.

The immediate postoperative course was very stormy. She was markedly distended and vomited; the temperature was persistently ele-

vated, the pulse poor, and outlook grave. After several days the distention diminished, the temperature declined, food was tolerated, and she appeared much better. The abdominal wound healed by primary union and she was discharged on the fourteenth postoperative day.

When seen two weeks later she complained of headaches, weakness, vomiting, and exhaustion. The abdomen was distended, tender, and presented evidence of free fluid in the peritoneal cavity. The liver was

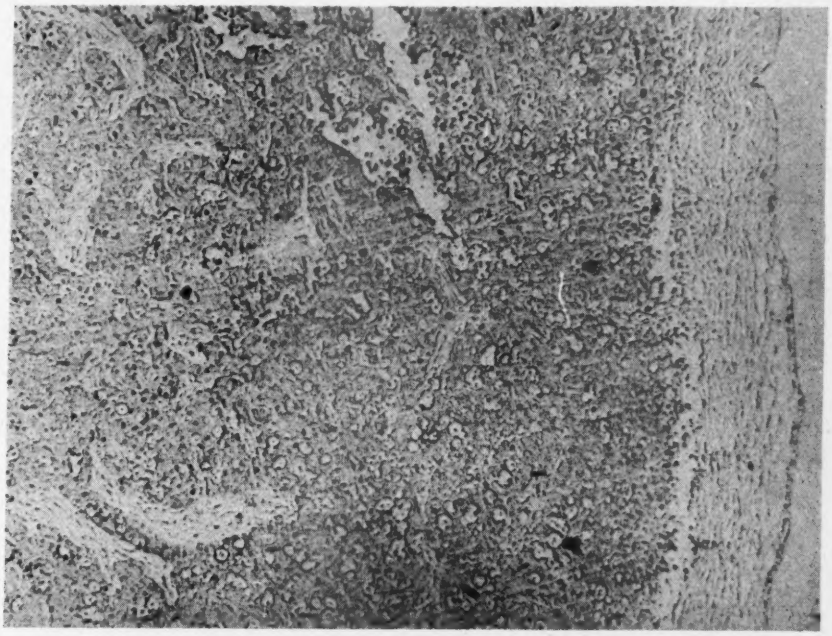


Fig. 1.—Low-power section of fibrosed omentum containing a highly cellular tumor whose cells are arranged in cords suggestive of incomplete gland formation. Specimen was removed at first operation.

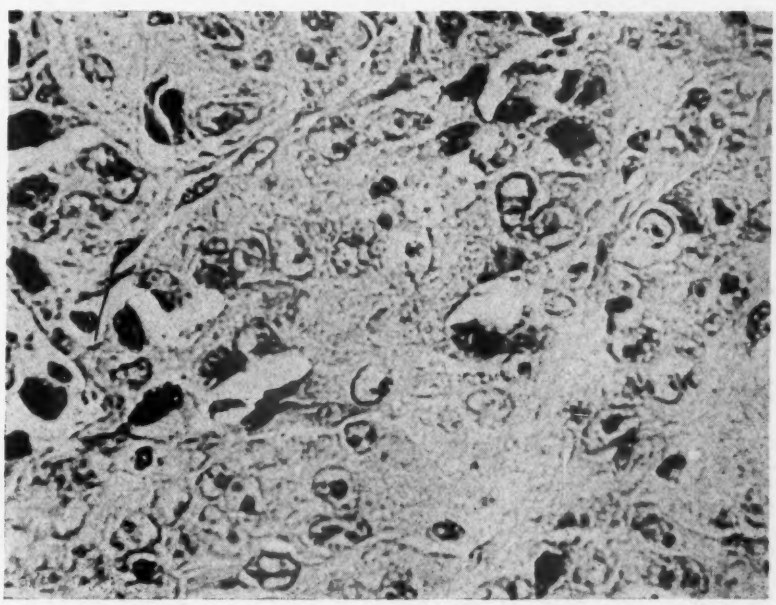


Fig. 2.—High-power section of Fig. 1, composed of polygonal epithelial cells with hyperchromatic nuclei and mitotic figures. Multinucleated tumor cells are also present.

palpable, and multiple masses were still felt in the abdomen. A few weeks later the spasticity and tenderness in the upper abdomen still persisted but the masses were not felt, and the liver enlargement receded. She still complained of some pain in the upper abdomen, but vomiting had ceased, her appetite had improved, and she had gained 4 pounds.

Six weeks later she stated she had menstruated for the first time since her delivery. She felt nervous, had slight abdominal pain, and had gained eleven pounds. There was still slight tenderness in the upper abdomen, but no masses were palpable. The liver could not be felt. For the next year she remained under observation and continually showed improvement. Her weight, although remaining stationary, was normal; her menses were regular, and she had no complaints.

In April, 1943, three years postoperative, she was found to be pregnant, but because of her previous history and findings, she was admitted to the hospital for study and consultation. The surgical, medical, and pathological departments were consulted. In view of the previous history and operative findings, they all advised termination of the pregnancy by abdominal hysterotomy and sterilization.

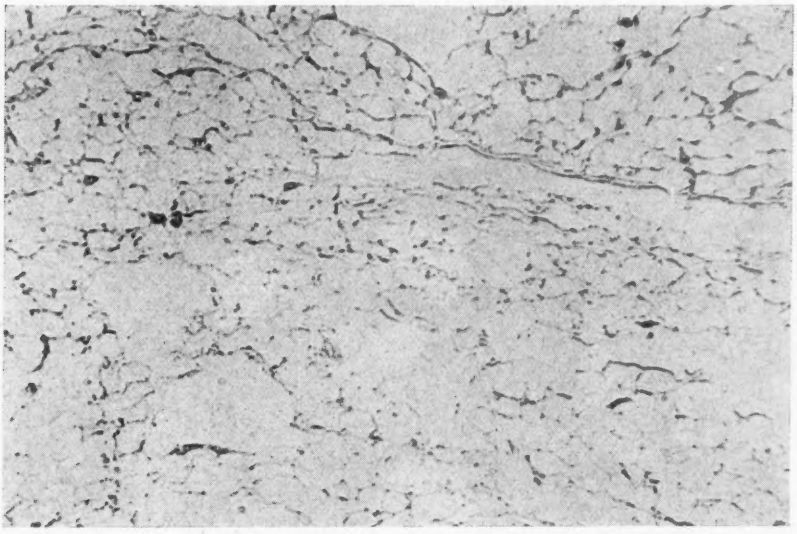
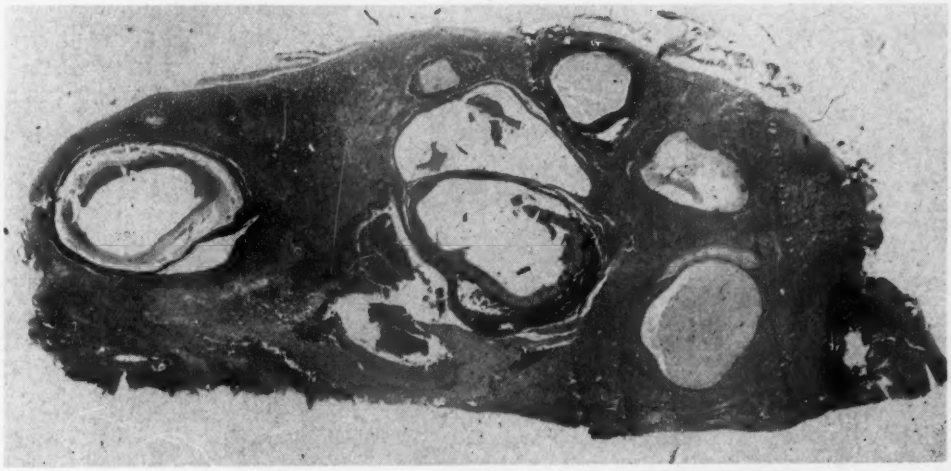


Fig. 3.—Section of omentum removed at the second operation showing normal fat tissue and no malignancy.

At operation the liver edge was found to be regular and smooth. There were a few soft adhesions between the omentum and the parietal peritoneum. There were no implants on the peritoneum, omentum, or other abdominal viscera. The uterus was enlarged, bluish, soft, with several pedunculated fibroids on its posterior wall and a larger degenerated fibroid on the left side. There were, in addition, numerous subperitoneal elevations on the fundus of the uterus and suggestions of peritoneal implants. Both ovaries and tubes were normal. Because of these subperitoneal elevations, a total hysterectomy with bilateral salpingo-oophorectomy was performed. Small pieces of omentum were removed for study. Microscopic study of the uterus, tubes, ovaries, and sections of omentum revealed no evidence of carcinomatous degeneration. The postoperative course was smooth and uneventful. The patient was discharged on the fourteenth postoperative day.

She has since been seen on several occasions and except for slight menopausal symptoms has no other complaints. At the present time there is no evidence of recurrence of the neoplastic lesion found four and a half years ago at the first operation.

A.



B.

Fig. 4.—*A*, Hemisection of left ovary removed at second operation with corpus luteum verum. *B*, Hemisection of right ovary removed at second operation showing a normal functioning ovary with multiple follicular cysts. In neither ovary was any malignancy present.

Discussion

There is abundant experimental evidence in animals suggesting that persistent estrogen therapy produces atypical cancerous and precancerous lesions of the accessory genitalia. There are also reports of the production of cancer of the breast in the human female by indiscriminate use of massive doses of estrogenic substances. The prevalence of genital and breast cancer in women past the menopause is explained by Allen as due to the continuous abnormal stimulation of estrogen, unopposed by progesterone, which ceases to be secreted at the climacteric.

Some investigators maintain that pregnancy causes cancer of the cervix to grow very fast and invade the lymphatics, but others, such as Frank, and Peller and Emge hold an opposite view. Mankin claims that pregnancy retards existing carcinoma of the cervix and breast. DeLee and Greenhill state, on the other hand, that the termination of pregnancy by birth or abortion significantly increases neoplastic growth

and that during pregnancy progesterone checks the carcinogenic action of estrin. They also maintain that after the end of pregnancy, estrogen acts unopposed to promote the growth of the lesion because the titer of progesterone is markedly diminished. This explains the extensive growth of the lesion in this case soon after delivery, but it throws no light on its subsequent spontaneous disappearance as demonstrated by later laparotomy and clinical observation.

References

Allaben, G. R., and Owen, S. E.: J. A. M. A. **112**: 1933, 1939.
Allen, E. S.: Kentucky M. J. **25**: 615, 1927.
Auchincloss, H., and Haagenson, C. D.: J. A. M. A. **114**: 1517, 1940.
DeLee, J. B., and Greenhill, J. P.: The Principles and Practice of Obstetrics, ed. 8, Philadelphia, 1943, W. B. Saunders Co., p. 550.
Emge, L. A.: Am. J. Obst. & Gynec. **28**: 682, 1934.
Ewing, J.: Neoplastic Diseases, ed. 4, Philadelphia, 1940, W. B. Saunders Co., p. 46.
Frank, L. W.: Kentucky M. J. **40**: 165, 1942.
Hoffman, J.: Female Endocrinology, Philadelphia, 1944, W. B. Saunders Co., pp. 38-41.
Mankin, Z. W.: Arch. f. klin. Chir. **199**: 337, 1940.
Mundell, J. J.: Am. J. Obst. & Gynec. **13**: 86, 1927.
Parsons, W. H., and McCall, E. F.: Surgery **9**: 780, 1941.
Peller, S.: Die Geburtstod, Vienna, 1936, Franz Deuticke.

960 Sterling Place

877 Empire Boulevard

PREGNANCY AFTER RENAL BIOPSY IN HYPERTENSIVE DISEASE

R. S. Siddall, M.D., Detroit, Mich.
(From Harper Hospital and Wayne University College of Medicine)

ALTHOUGH the final kidney changes associated with death from hypertensive disease and its complications are rather well established, knowledge of the intervening steps has been largely lacking. Recently, however, studies[1-3] of renal biopsy material have given a better understanding of the actual kidney picture in the various grades or stages of hypertension. As one example of the importance of these observations, it has now been reported that in at least some cases the vascular changes are primary outside of the kidneys, thus indicating that true essential hypertension without renal changes does exist. Also, even when the kidney vessels themselves are involved, it has been shown that there may be at first no demonstrable renal parenchymal or functional alterations. Moreover, there is some reason to believe that the procedure for obtaining renal biopsy material, being reasonably safe, may offer valuable additional information as a guide in surgical treatment of hypertension.

It was in such a patient who had been investigated for possible surgery that pregnancy occurred, thus presenting the first instance, so far as I have been able to determine, of pregnancy complicating hypertensive disease with renal biopsy findings. The case report is of some interest for its uniqueness. There is also the suggestion here that data accumulated from this and other cases could conceivably in time establish histological standards for prognosis and treatment in hypertensive women who become pregnant. These women make up a large group of obstetric patients, for many of whom all the tests devised up to the present time have offered little more than the vaguest information regarding the outcome to be expected.

Case Report

Harper Hospital, No. 241491. The patient was 30 years old and had been married five years, with no pregnancies. She was admitted to the hospital March 16, 1942, with the history of headaches beginning eight years before and gradually becoming frequent and very severe. High blood pressure had been discovered several weeks before admission when a physician was consulted for sudden, sharp pain in the left side of the chest. The past history was negative for infections or other causes of hypertension. The patient's father had lived to be 86 years of age. Her mother died of dropsy and heart trouble at 56 years of age. Several brothers and sisters were well, but one brother, 44 years old, was said to have high blood pressure.

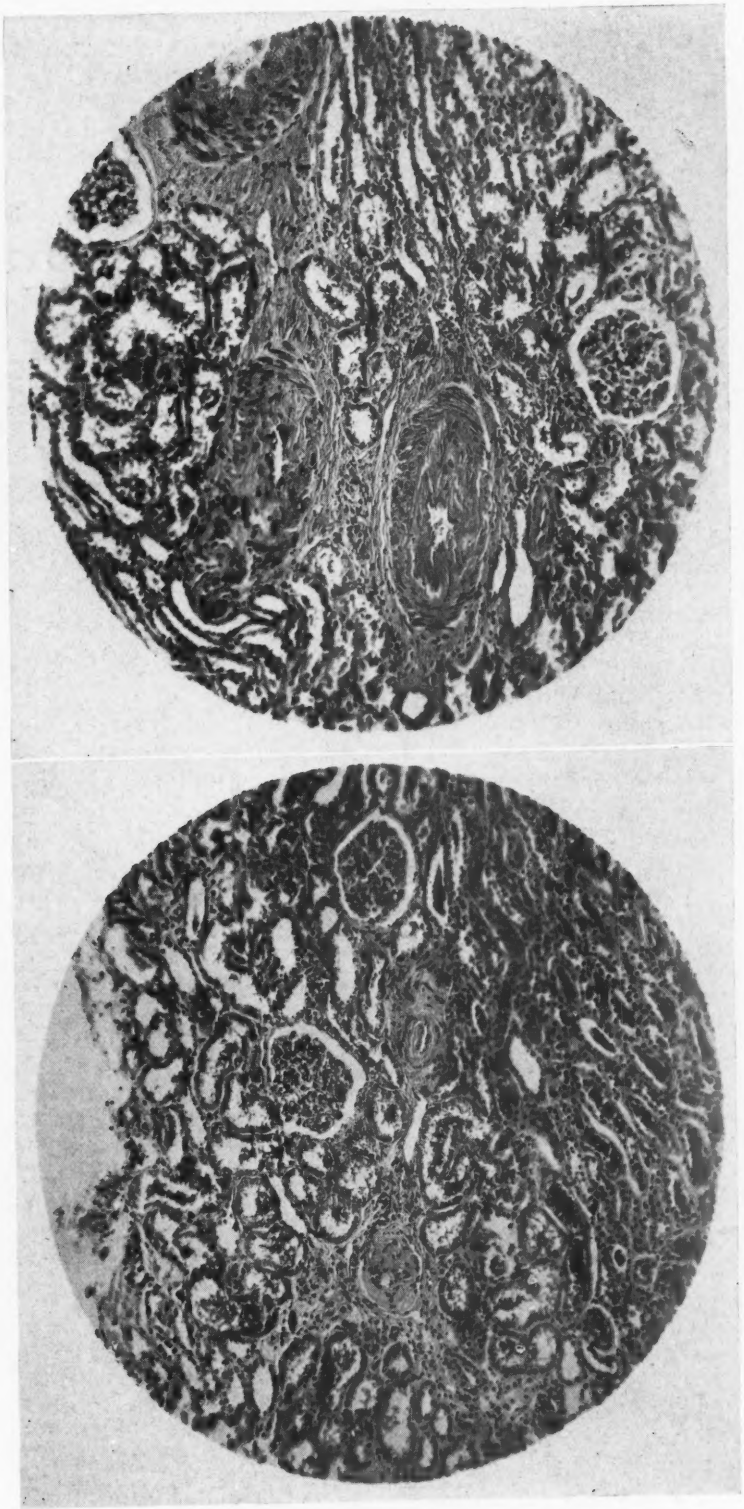
On admission the blood pressure was 205/120. The heart was slightly enlarged, but sounds were clear and of good tone. Funduscopic examination showed no neuroretinitis. Some of the retinal arteries were tortuous and smaller than usual but not definitely constricted. The veins were rather full, but there was no arteriovenous nicking. Otherwise the physical findings were unimportant.

All the usual laboratory tests as well as many special studies were made, with results of the more important ones as follows: The Kahn test was negative for syphilis, and a chest x-ray showed only slight cardiac enlargement. Urinalyses were all negative for albumin and glucose, and specific gravity varied between 1.018 and 1.030. A complete blood count gave normal findings. Fasting sugar was 0.115 Gm., nonprotein nitrogen 40.2, and later, 33.8 mg., and chlorides as NaCl, 495 mg. per 100 c.c. of whole blood. The total serum proteins were 6.16 Gm., the albumin being 4.41 and globulin 1.75, thus giving an albumin-globulin ratio of 2.5 to 1. Blood urea clearances (110 and 119 per cent) indicated normal function. In a cold pressor test with immersion for ten minutes, the maximum elevation of blood pressure occurred in two minutes from an initial 204/128 up to 224/128. Fourteen minutes after immersion the two readings were 200/130. Nitroglycerin, $\frac{1}{100}$ grain, under the tongue caused a maximum drop of blood pressure in five minutes to 188/132 from 206/130. Cystoscopic examination, with ureteral catheterization, was entirely negative except for slight constriction of the left ureter, and a retrograde pyelogram showed no x-ray evidence of urinary tract abnormality.

On March 16, 1942, through an incision in Petit's triangle the lower pole of the right kidney was exposed by Dr. F. C. Cole, and a biopsy specimen obtained with the special punch designed by Dr. T. N. Horan. Various stains of sections from this tissue showed arteriosclerosis of all arteries and arterioles. There were, however, no necrotic areas and no demonstrably definite glomerular or tubular changes although there was some question regarding the tubular epithelium in certain areas. According to the descriptions of Castleman and Smithwick, the picture was that of moderately advanced renal vascular disease and was comparable to their Grade 2 (Figs. 1 and 2).

After discharge from the hospital there was only one menstrual period, which began April 24, 1942, and on August 11 the uterus was found to be enlarged to the size of fourteen to sixteen weeks' pregnancy. At that time the only finding of importance was a blood pressure of 220/135. In view of the dangers anticipated, interruption of pregnancy was advised, but this was refused.

The pregnancy progressed uneventfully, except for persistence of the hypertension and headaches, until about the beginning of the thirtieth week. Total weight gained was 14 pounds. On Nov. 14, 1942, albuminuria was noted for the first time. This increased from slight to marked degree, and many hyaline casts had appeared by November 18, although the systolic blood pressure remained around 220. After admission to the hospital on November 20, the ordinary and special tests were repeated with essentially normal results in most instances. Whole



Figs. 1 and 2.—Sections from renal biopsy material, magnified 100 times. Marked arteriosclerosis of small arteries and arterioles. No demonstrable changes in glomeruli or tubules.

blood nonprotein nitrogen varied between 26.5 and 33.8 mg. per 100 c.c. and was 28 mg. on the day of delivery. The plasma CO_2 volume per cent was 52 and the blood cholesterol 277 mg. per 100 c.c. Total serum proteins were 5.0 Gm.; the albumin being 3.3, and globulin 1.7, thus giving an albumin-globulin ratio of 1.9 to 1. Urea clearance was well within normal limits. One appreciable deviation from normal was found in the phenolsulfonphthalein test in which the first 15-minute elimination was reduced to 15 per cent. Also, the eyegrounds now showed definite nicking of the veins, but no neuroretinitis.

The course in the hospital was marked by an initial slight lowering of blood pressure to 205 systolic, but with return after a few days to readings varying from 220 to 235. Albuminuria continued, and along with this occurred hyaline and granular casts in increasing numbers. Headaches now became progressively worse until by the end of a week the patient complained of almost constant pain in the head which was so intense as to greatly interfere with sleep. Vomiting also became frequent. In view of these distressing and alarming symptoms delivery seemed urgent, and in the interests of the premature child, cesarean section was decided upon.

On Nov. 28, 1942, classical cesarean section was done under general anesthesia. Sterilization had been suggested but was refused. The child, a 4 pound 1 ounce male, was in good condition at birth but died of prematurity and atelectasis after forty-nine hours. Recovery of the mother from the surgical standpoint was uneventful. The placenta showed no infarcts of appreciable size or any other abnormality. It is noteworthy that at the time of operation the kidneys seemed to be of normal size and shape, and there was no palpable evidence of suprarenal tumor.

After an immediate postoperative drop in blood pressure, the former levels of 220 to 235 systolic soon returned and were maintained during the stay in the hospital. Albuminuria gradually diminished until only a trace of albumin was present. An outstanding change was the complete relief from headaches within forty-eight hours. On the fourth day post partum the left retina was found to have a definite exudate below the macula, as well as more marked nicking of the veins and occlusion of a few of the vessels. Examination during the next 23 months showed somewhat higher blood pressure levels (250/155 on Oct. 30, 1944) with slight albuminuria and occasional hyaline casts persisting.

This case tends to confirm the previously debatable but yet commonly held clinical opinion that essential hypertension (without kidney changes except for arteriosclerosis) is likely to go on to renal functional impairment when complicated by pregnancy. It also adds some weight to the belief that, in addition to the immediate dangers, these patients are usually left worse off by the pregnancy; even though, as in this instance, emptying of the uterus is instituted with the early signs of renal parenchymal involvement. Much less definite, but in accord with our experience, is the suggestion here that these patients will do well with operative intervention, provided it is undertaken before the onset or early in the development of renal insufficiency.

Grateful acknowledgment is made for the valuable advice and assistance of Dr. H. A. Freund, Dr. A. H. Price, and Dr. W. B. Cooksey of the Department of Medicine, Harper Hospital.

References

1. Freund, H. A., Cole, F. C., Horan, T. N., and Miller, S.: Harper Hosp. Bull. 1: 129, 1942.
2. Castleman, B., and Smithwick, R. H.: J. A. M. A. 121: 1256, 1943.
3. Talbott, J. H., Castleman, B., Smithwick, R. H., Melville, R. S., and Pecora, L. J.: J. Clin. Investigation 22: 387, 1943.

955 Fisher Building

A DEMONSTRATION MODEL FOR UTEROTUBAL INSUFFLATION*

I. C. Rubin, M.D., F.A.C.S., New York, N. Y.

IN RESPONSE to the need of demonstrating to medical students and physicians the method of uterotubal insufflation, the present working model has been developed. It has undergone several stages of improvement. In its present form it consists of three major parts constructed out of three plastic media:

1. A translucent posterior section, cast in cellulose acetate, 1/32 inch thick, represents the abdominal viscera in natural size and is painted approximately in their natural colors.

2. An anterior section formed of plexiglas represents the peritoneal cavity, and consists of a double-walled water container or jacket 1/8 inch thick which is clear and transparent. Its shape is modeled after the contour of the abdominal wall and the underlying viscera. A narrow space occupying its major portion is expanded somewhat above where it is closed by a transverse bar at the level of the natural diaphragm. It is provided with a spout through which water or mineral oil can be introduced to act as the medium through which CO_2 is percolated. The lowermost portion of the water jacket is expanded to contain the uterus, tubes, and ovaries, and conforms to the configuration of the female pelvis. At the pelvic brim the intestines have been artificially modified so as not to obscure the genital organs which are transilluminated by means of an electric light placed behind the supporting display panel. The lower pole of the expanded plexiglas chamber is perforated at an angle to allow the cervix to project into the vaginal canal.

3. The external genitalia (vulva) are carved out of solid lucite hollowed out at its center to represent the vagina, which permits the introduction of a small-sized speculum. The uterus and adnexae are cast in cellulose acetate; the cervix is held in place by two plexiglas collarettes on the inside and outside and cemented by a waterproof compound.

Note.—The year 1945 marks the twenty-fifth anniversary of the employment of tubal insufflation for diagnostic purposes. The first trial was made in the x-ray department of the Mt. Sinai Hospital. In this woman the abdominal wall was seen by those present to rise and the conclusion was reached that the gas (oxygen) must have entered the peritoneal cavity via the uterus and through the Fallopian tubes, producing a subphrenic pneumoperitoneum in that patient as demonstrated later by the x-ray films. The use of oxygen gas was found safe and harmless but, later, carbon dioxide was substituted as being even safer and more rapidly absorbed. This first patient upon whom the method was tried became pregnant within two months and further experiments were made to determine the tolerance, the amount of gas necessary, the pressure under which it was introduced, the possibility of infection, the danger of embolism, the interpretation of the findings and their reliability in diagnosis, as well as the indications and contraindications.

The first full report was made in 1920 and was based on 55 cases. Other observers supplemented this by accounts of their own experiences, and Dawson Furniss, in his paper published in 1921, applied to the procedure the name of its originator, and it is now widely known as the Rubin test. Modifications and improvements, with combinations of kymograph tracings and other features have marked the progress in this field of an outstanding contribution to American gynecologic practice.

The Editor.

*Made by The Displayers, New York, N. Y.

A metal uterine cannula is firmly cemented into the cervical canal which communicates with a hollowed-out uterine cavity. Two metal tubes are channeled through the Fallopian tubes as far as the fimbriated ends in order to allow the CO_2 to pass into the water chamber. The outer end of the cannula is fitted with a stopcock to prevent the water or mineral oil from leaking.

The model as it stands is light, portable, and durable, having the advantages of plastics, which are superior to plaster models or those made out of papier-mâche or glass. It withstands rough usage better than plaster anatomy models, which, besides being heavy, are extremely fragile. A compact folding arrangement on the back of the display panel makes for easy setup and supports the model at exactly the correct angle. Here also a small hinged door provides easy access and free ventilation for the light which illuminates the viscera. By means of a chromium reflector the light is especially concentrated upon the uterus and tubes.

Fig. 1.—Diagrammatic representation of model.

The illumination from behind the genitalia is re-enforced by a light shining from above. Their combined effect brings out the colors of the abdominal viscera and highlights the gas bubbles as they rise toward the diaphragm in the transparent anterior water container. The effect thus produced resembles satisfactorily what actually takes place during clinical uterotubal insufflation.

To operate the demonstration model it is necessary to set the clinical insufflation apparatus at a higher level than the uterine cannula in order to prevent regurgitation into the inflow tubing. The reduction valve of the insufflation apparatus is set at 15 pounds' pressure. The

speed-regulating valve is gauged to deliver 60 c.c. per minute. The inflow glass stopcock is now opened, followed by opening the metal stopcock connecting the uterine cannula, when CO_2 will be seen to pass up in bubbles from the fimbriated ends into and through the liquid filling the water container. As the model is tilted at an angle of 45 degrees or more, the gas bubbles are seen to rise toward the diaphragm where they collect in a fashion simulating a subphrenic pneumoperitoneum. The level of the diaphragm is simulated by placing a dark cardboard which is bent over the anterior aspect of the model at the level of the mid-portion of the liver.

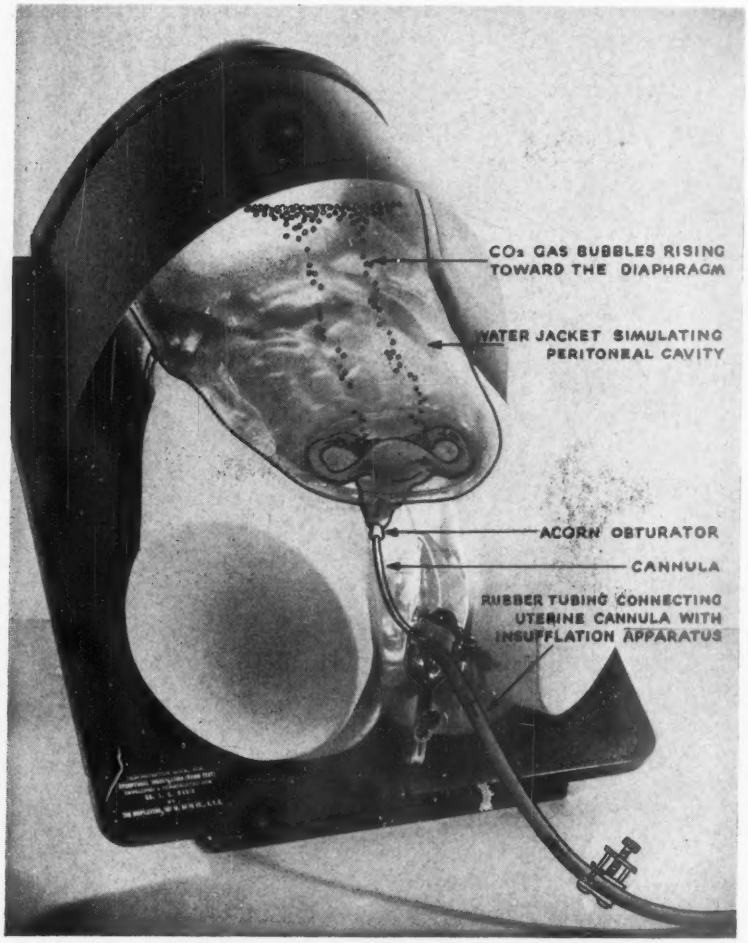

CO₂ GAS BUBBLES RISING TOWARD THE DIAPHRAGM
WATER JACKET SIMULATING PERITONEAL CAVITY
ACORN OBTURATOR
CANNULA
RUBBER TUBING CONNECTING UTERINE CANNULA WITH INSUFFLATION APPARATUS

Fig. 2.—Photograph of full-sized model.

In order to reproduce the different graphs characteristic of patency, nonpatency, spasm, and partial patency of permeable strictures, a screw clamp (Murphy type) is attached to the rubber tubing near its insertion into the uterine cannula. To demonstrate tubal patency it is only necessary to allow the CO_2 gas to pass through the tube system until the bubbles appear at one or both fimbria. As the caliber of the metallic tubing within the Fallopian tubes is different, the CO_2 will be seen to escape through the wider tube. To demonstrate tubal patency on both sides it is only necessary to tighten the clamp momentarily, thus increasing the pressure which is sufficient on releasing the constriction to force the gas also through the narrower-calibered metal tubing. Both fimbria will then be seen to emit CO_2 gas bubbles. The same thing can be accomplished by momentarily increasing the speed of flow. To demon-

strate the rhythmic oscillations commonly observed in normal tubal patency and function, the clamp may be tightened and relaxed intermittently 3 or 4 times per minute. To reproduce the kymographic tracing characteristic of tubal nonpatency, the clamp should be tightened till the pressure is 200 mm. Hg. The inflow glass stopcock is closed for several seconds and then the clamp is released, thus producing a sharp drop of pressure to zero.

Spasm may be imitated by tightening the clamp till a pressure of 140 mm. Hg or higher is recorded on the kymograph, when it is relaxed till the pressure drops to 60 from 80 mm. Hg followed by intermittent tightening and relaxing the clamp, which reproduces rhythmic oscillations as met in normal tubal pregnancy.

To demonstrate the effect of tubal strictures or adhesions with partial permeability, it is necessary to tighten the clamp till the pressure rises to 150 mm. Hg or higher, and then relax the clamp slightly, allowing the pressure to drop gradually without producing oscillations.

The various effects now produced by hand can be achieved automatically by an electrical device which will eventually be available.

I wish to acknowledge my indebtedness to The Displayers, to Dr. R. L. Dickinson, Mr. Michael Brenner, and Mr. Malcolm Steiner for their valuable help in the construction of this model.

SURGICAL TREATMENT OF ABSENCE OF THE VAGINA

Report of Two Cases

FRANK E. WHITACRE, M.D., MEMPHIS, TENN., AND
C. Y. CHEN, M.D., PEKING, CHINA
(From the Department of Obstetrics and Gynecology, and the Department of Surgery, Peiping Union Medical College)

THERE should be little question as to the advisability of attempting surgical correction of absence of the vagina in suitable cases. The most common (as seen in China) and the most difficult to treat are those of traumatic origin in which closure of the vagina is secondary to the use of sharp instruments or the ill-advised instillation of strong, corrosive substances into the vagina by untrained midwives, presumably for the treatment of dysmenorrhea. Congenital anomalies of the female generative tract vary in degree from complete absence of the entire tract to minor defects. Clinically, the most common is absence of the vagina, in whole or in part, with a rudimentary cordlike uterus associated with normal ovaries, uterine tubes, and external genitalia. Frequently, this condition is not suspected until puberty, or even after marriage, as illustrated by the two cases herein described.

Developmental anomalies of the female genitourinary tract are encountered often enough so that their diagnosis and treatment demand an understanding of normal embryologic development. As the genital and urinary tracts are closely associated from the standpoint of both origin and growth, it has long been recognized that anomalies in the one may be accompanied by anomalies in the other. There is general agreement that the cervix, uterus, and Fallopian tubes develop from fusion of the

Müllerian ducts, but disagreement arises concerning the embryology of the vagina. The work of Koff[1] and the morphology of the various degrees of anomaly as seen clinically indicate that the upper two-thirds of the vagina develops from the lower portion of the fused Müllerian ducts, whereas the lower one-third originates from the urogenital sinus. There is first division of the cloaca whereby the dorsal one-third becomes the rectum. The ventral portion is further divided into three segments, the middle one of which is known as the pars pelvina. The lower portion of the vagina is formed from the sinovaginal bulbs and pars pelvina of the urogenital sinus. Meyer[2] has convincingly shown that the vaginal epithelium is derived from the urogenital sinus by means of invasion and replacement of Müllerian duct epithelium.

Correction of this difficulty should be attempted in young women with well-established secondary sex characteristics who are married or contemplate marriage. The difficulties encountered in the treatment of this condition have stimulated much thought, resulting in the suggestion of several operative methods. The purpose of all of these operations is to open a passage between the bladder and rectum and to provide a suitable epithelial surface. A classification into five groups according to procedure is suggested. It should be mentioned that Dupuytren in 1817 is generally considered the first to have attempted the construction of an artificial vagina.

1. *Use of the Small Intestine.*—Baldwin[3] in 1904 suggested opening a space between the bladder and the rectum into the cul-de-sac. A segment of the sigmoid colon or terminal ilium is then mobilized and with its mesentery pulled downward through the pelvis and a suitable opening made and stitched to the outside skin. The middle portion of the ilium is brought downward, forming a double barrel cavity, later converted into one by a pressure clamp. The continuity of the bowel is reestablished by anastomosis. However, Baldwin[4] first performed the operation in 1907 using the lower ilium as a substitute for the absent vagina.

In 1909 Mori[5] devised a method of using the terminal portion of the ilium but pulled down one end of the mobilized segment. Difficulty was encountered in approximating the intestine to the outside skin but the result was satisfactory.

2. *Use of the Rectum.*—The operation devised by Schubert[6] is the best known of this group. In 1911 he described his technique, which consists of opening a space between the bladder and rectum. The rectum is dissected from the external sphincter, the coccyx removed from behind, the rectum and sigmoid colon mobilized without opening the peritoneum, and 5 inches of the rectum amputated without severing the blood supply. The amputated portion of the rectum is raised into the artificial opening and the distal end of the bowel pulled down through the sphincter and stitched to the skin. This technique may have been based on that of Sneguireff,[7] who, in 1892, resected a portion of the rectum in constructing an artificial vagina, and on that of Popow[8] who further developed this idea.

3. *Use of Skin Flaps.*—Several authors have suggested opening a space between the bladder and rectum and turning in skin flaps. The operation devised by Graves[9] consists of utilizing the labia minora and skin from the adjacent inner surfaces of the thigh to cover a glass mold. The pouch is then inverted into the previously dissected opening between the bladder and rectum and secured by stitches.

An ingenious and successful tube flap operation was devised by Frank and Geist[10] in 1927. A tube flap was made from the inner surface of the

thigh and the distal end gradually severed and finally inserted into a prepared space between the bladder and the rectum. The entire procedure required about there months' hospitalization.

4. *Use of Pressure.*—The most common effect of pressure is from cohabitation, which accounts for some of the shallow pouches seen in this group of women. Only a small depression is possible and is generally unsatisfactory. Falls[11] in 1940 described a new method. A circular disk is cut and pressed inward in the position of the proposed new cavity. Epithelization is aided by making four small flaps from the skin which are sutureed to the sunken disk. Healing is usually complete in two weeks and depth is further increased by pressure with a vaginal plug. This procedure may be repeated to secure further depth.

Frank[12] in 1941 suggested a nonsurgical method of simple pressure with glass tubes of graduated sizes. He has carried out this procedure on nine patients.

5. *Use of Vaginal Mold With or Without Skin Grafts.*—Although he had described his method two years previously, Wharton,[13] in 1940, reported a series of twelve patients operated upon by seven surgeons. His technique consists of opening a space between the bladder and the rectum into which is inserted a form of appropriate size covered by a rubber condom. The form may be of various materials but Wharton prefers balsa wood. The patient should wear the form for several weeks, or until the new canal has been thoroughly covered with epithelium. He believes that epithelization occurs from the edges of the introitus and that grafts from the skin are not necessary.

Choice of Method

In the selection of a method of treatment for this anomaly the safety of the patient must be considered more important than the final result. Undoubtedly, the Baldwin operation has been highly successful in some cases and has been enthusiastically recommended by Judin[14] and by Bodenheimer and Goldman.[15] Frank,[12] however, in a review of the treatment of this condition, mentions fatalities connected with this operation amounting to 17.5 per cent, which he considers to be lower than the actual. Masson[16] has been an advocate of the Baldwin operation, having operated upon ten cases successfully, but more recently he has performed the operation four times with two deaths and is impressed with its danger.

In 1936, in Berlin, one of us (F. E. W.) had the privilege of seeing three patients operated upon by the Schubert technique (two by Stoeckel and one by Schubert) and although all three patients enjoyed a smooth convalescence, the danger of the procedure could not be overlooked. During the process of freeing the sigmoid colon by blunt dissection after the coccyx has been removed, there is ample opportunity to damage one of the great blood vessels. Also, the danger of infection is considerable and Frank mentions three deaths in 53 cases operated upon by the Schubert method. We believe it unjustifiable to treat a condition of no danger to the patient by a method carrying considerable risk.

The use of skin flaps turned in from the adjacent external genitalia and thighs gives an opportunity for considerable scar tissue formation. A safe procedure is the Frank-Geist operation recently described by Dannreuther,[17] who successfully performed the operation and was favorably impressed with the final result but considered the prolonged hospitalization a disadvantage.

The Falls operation seems to be practical and to produce a good result but we have had as yet no experience with the method. The nonsurgical method of Frank, though time consuming, does not require hospitalization and if a canal of suitable depth can be produced by this simple method, it is to be recommended.

As previously mentioned, the most common need for surgical intervention of this kind in China is in patients with partial or complete stenosis of the vagina resulting from trauma or the action of chemicals. Many of these patients have been so mutilated with sharp hooks that the entire floor of the bladder and the anterior wall of the rectum are torn out, followed by extensive scar formation. The only possibility in such cases would be the Baldwin operation, but such extensive damage is hopeless of adequate repair. We operated upon two less mutilated patients with complete stenosis of the vagina due to trauma and elected to use a method of inserting Thiersch grafts applied to a mold of suitable size. As these two women were lost sight of, the final results cannot be reported.

A detailed report, however, of two cases of congenital absence of the vagina in which operation was performed will be given.

Fig. 1.—Hardwood form, which we no longer use, was covered by a rubber condom. A Thiersch graft was applied with outer surface looking inward.

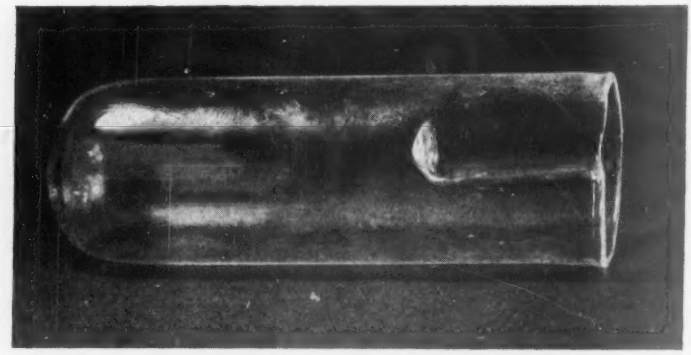


Fig. 2.—Mold of Pyrex glass which is more suitable than wood. The Thiersch graft is applied directly to the glass with the outer surface looking inward. The glass form is 11 cm. long, 3.2 cm. wide in the middle, and 3 cm. wide at each end. To protect the urethra, a groove is sunk at the open end—3 cm. by 1 cm. Glass form also permits observation of epithelization without removing form.

Technique

The patient should be prepared and draped for vaginal operation. A transverse or crucial incision should be made between the urethra and anus and blunt dissection begun superior to the rectovaginal fascia. This is easily carried up to the cul-de-sac, usually a distance of about 11 or 12 cm. Bleeding points should be controlled.

At first a wooden form (Fig. 1) covered by a condom was used. A split Thiersch graft from the inner surface of the thigh should be cut, applied with the outer surface to the mold and inserted into the prepared cavity.

Several materials have been used for the construction of this type of form. Miller[18] has warned against the use of some plastic materials which may have disastrous results. Pyrex glass was selected as the most suitable material for the mold, being superior to the wooden form, but we later found that this had been suggested by Meigs.[19]

Counsellor[20] suggests using a Thiersch graft on a rubber tube and attributes the idea to Gilles and McIndoe of London, who used the principle in cranial surgery and also in the construction of the male urethra. Barrows[21] reports a similar procedure and attributes the idea to Kirschner and Wagner, who used a rubber sponge as a vaginal mold. The Pyrex form (Fig. 2), which we have used, is 11 cm. long, 3.2 cm. in diameter in the middle, and 3 cm. in diameter at each end. At the open end it has been found desirable to sink a small groove which is 1 cm. deep and 3 cm. long. With this form inserted so that the groove protects the urethra, there is no damage to that structure from pressure necrosis even though it may be necessary to use an indwelling catheter.

After the first week, the glass form may be removed for a few minutes and the newly epitheliated cavity irrigated with normal saline or a mild antiseptic solution. By the end of two or three weeks the patients may be discharged from the hospital and treated as an outpatient.

It is just as important to keep the cavity open as it is to form it in the first place, and our previous experience with the two cases of traumatic closure of the vagina indicates that it is desirable for the patient to wear the form secured by a T-binder, a few hours a day for a period of six months. Owens[22] has suggested using elastic bands attached to an abdominal belt to hold the form and graft in place and this is an improvement over the T-binder. The two patients herein described were instructed to wear the form for six months and the results were gratifying. Intercourse should do no harm two months after the operation.

Report of Cases

Case 1.—C. S. L., a married Chinese woman 22 years of age, was seen in our gynecologic clinic on Sept. 3, 1940. She had never had any menstrual flow and experienced no periodic attacks of abdominal pain. The breasts started to develop at the age of 12 years, and pubic and axillary hair appeared when she was 15 years of age. She had been married for seven years and attempts at intercourse had been painful and unsuccessful. There was no history of trauma, infection, or the use of foreign substances in the genital tract.

The general physical examination showed essentially normal findings. The growth of hair was normal and the breasts well developed. Body contours were distinctly female in type. The external genitalia were well developed. The vagina was represented by a small pouch 4 cm. deep and 1 cm. in width. There was a small defect anterior to this dimple and some scar tissue at this point. On rectal examination, the cervix and uterus were felt together to be about 4 cm. in length. This body was narrow, cordlike, and hard, and the uterus was thought to be about the size of an olive. No other masses were felt. The blood hemoglobin was 15.3 Gm. per 100 c.c., and the urine was normal. Retrograde pyelogram and cystoscopy failed to show any congenital anomaly in the urinary tract.

The patient was operated upon, Dec. 10, 1940, by the technique already described. There was slight bleeding from the newly constructed vagina for the first three days and it was necessary to insert a stitch in the new vaginal vault corresponding in position to the base of the broad ligaments. After this, healing was uncomplicated. The glass form was removed at the end of a week and the newly formed canal was found to be covered by a thin layer of epithelium, soft and pliable, and 12 cm. in length. The patient was discharged from the hospital six weeks after operation and followed in the outpatient clinic.

Examination at the end of five and one-half months showed that the vagina was soft, there was no sign of scar tissue, and two fingers could be inserted in the introitus without difficulty. Sexual intercourse was reported to be satisfactory. The operative result in this patient is shown in Fig. 3.

CASE 2.—L. Y. F., a Chinese woman, aged 17 years, came to our gynecologic clinic on April 22, 1941, because of inability to have marital relations. She had been married for two weeks and attempts at intercourse had failed. She did not know that she was abnormal although she had never menstruated. Her medical history was irrelevant except that she had had palpitation of the heart and dyspnea on exertion for one year. On physical examination the patient was found to be somewhat underdeveloped and delicate in appearance. The breasts were small and pubic and axillary hair was scanty. The secondary sex characteristics were poorly developed and the operation was undertaken only upon the insistence of the patient and her mother in order to prevent a separation of the patient and her husband. We believe that the operation should be done only in the presence of well-developed secondary sex characteristics but felt that it was justifiable in this case and the patient was happy with the result. The heart was enlarged to the left with the physical findings of mitral valvular disease. The external genitalia were small but normal. The vagina was represented by a dimple 1 cm. in depth. On rectal examination a small lump about the size of the distal phalanx of the thumb was felt in the position of the cervix. No other masses were palpable. The blood hemoglobin was 15 Gm. per 100 c.c. and the urine was normal.

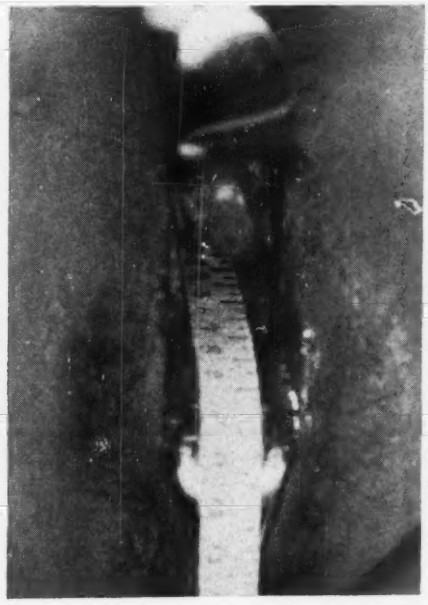


Fig. 3.

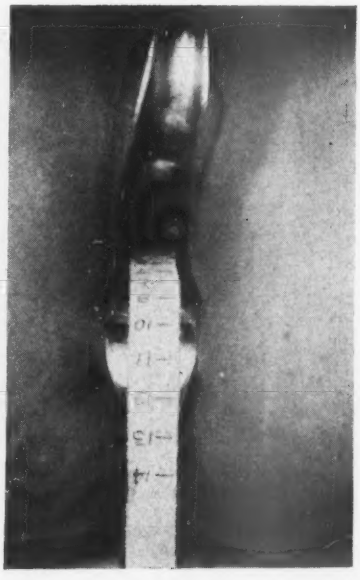


Fig. 4.

Fig. 3.—Case 1. Photograph taken nine weeks after operation. The vagina measures 11 cm.

Fig. 4.—Case 2. Photograph taken six months after operation. The vagina in this case also is 11 cm. in depth.

The patient was operated upon, May 17, 1941, according to the described technique. Her postoperative course was smooth except for difficulty in urination. After the first week the glass form was removed daily and replaced after the vagina was irrigated. Twenty-four days after operation, the patient was discharged from the hospital, at which time the new canal was covered by an ample layer of epithelium. She was followed in the outpatient clinic, and on November 5, stilbestrol (2.5 mg. corresponding to 2,500 rat units of estrin) was given by intramuscular injection, to observe the effect, if any, on the transplanted epithelium. The same amount of stilbestrol was given on November 8, and on November 11 progynon B oleosum (10,000 international units of estrin) was injected intramuscularly. No increase in the growth

of the epithelium was noted. The patient was last seen seven months after operation. The vagina was 12 cm. long, soft and pliable, without scar tissue, and cohabitation was satisfactory. The operative result is shown in Fig. 4.

Comment

It is highly important, once the artificial vagina has been constructed, to keep it open; this must be done by normal cohabitation or by artificial dilatation. If no method of occasional dilatation is provided, even after the period of healing is over, the canal will have a tendency to become gradually smaller. This emphasizes the desirability of performing the operation only on patients who are, or are about to be, married.

Epithelization was rapid in the first few days after operation and attempts at stimulation with estrogenic substance seemed unnecessary. Later, such substances were given by intramuscular injection (Case 2) and no effect on the epithelium was noted. We may have given the estrogenic substance too late in the process of epithelization or in insufficient amounts to produce an obvious effect. One might conclude that no increase in the growth of the transplanted epithelium is to be expected, because it is not of Müllerian duct origin. It is certain, however, from the abundant evidence, that estrin is a powerful growth stimulant to the normal vaginal epithelium, which is derived from the urogenital sinus and is therefore squamous in type. Also, in the absence of estrin, following the menopause, the skin may become dry and thin as well as the vaginal mucosa. Whether or not transplanted epithelium from the skin to form an artificial vagina responds in growth to estrin is not definitely settled. At any rate, it is evident that the grafts take and grow well without giving the patient estrogenic substance. The Pyrex mold-Thiersch graft method creates a canal similar to the normal vagina in its biologic characteristics as we have shown in another communication.[23]

Conclusions

There are several successful operations for the treatment of congenital absence of the vagina. We were interested in finding a safe procedure which is simple and produces a good anatomic and functional result without the growth of hair in the canal or irritating secretions. The Pyrex mold-Thiersch graft method produced such a result in the two cases herein described. The desirable psychic effect on women, after successful operation, was striking, as has been noticed by several authors. We are taking no exception to other methods of construction of an artificial vagina and the best method can be determined only by examination of the patients several years after operation.

References

1. Koff, A. K.: The Embryology of the Female Generative Tract in Curtis' Obstetrics and Gynecology, Philadelphia, 1933, W. B. Saunders Co., vol. 1, p. 572.
2. Meyer, R.: Zentralbl. f. Gynäk. **61**: 2846, 1937.
3. Baldwin, J. F.: Ann. Surg. **40**: 398, 1904.
4. Baldwin, J. F.: Am. J. Obst. **56**: 636, 1907.
5. Mori, M.: Zentralbl. f. Gynäk. **33**: 172, 1909.
6. Schubert, G.: Zentralbl. f. Gynäk. **35**: 1017, 1911.
7. Sneguireff, W. F.: Quoted by Dannreuther, W. T.[17]

8. Popow, D. D.: Quoted by Meyer, J.: Zentralbl. f. Gynäk. **42**: 639, 1918.
9. Graves, W. P.: Gynecology, Philadelphia, 1917, W. B. Saunders Co., p. 567.
10. Frank, R. T., and Geist, S. H.: AM. J. OBST. & GYNEC. **14**: 712, 1927.
11. Falls, F. H.: AM. J. OBST. & GYNEC. **40**: 906, 1940.
12. Frank, R. T.: J. Mt. Sinai Hosp. **7**: 259, 1941.
13. Wharton, L. R.: Ann. Surg. **111**: 1010, 1940.
14. Judin, S.: Surg., Gynec. & Obst. **44**: 530, 1927.
15. Bodenheimer, M., and Goldman, M. L.: J. Mt. Sinai Hosp. **7**: 310, 1941.
16. Masson, J. C.: in discussion of Falls, F. H.: AM. J. OBST. & GYNEC. **40**: 906, 1940.
17. Dannreuther, W. T.: AM. J. OBST. & GYNEC. **35**: 452, 1938.
18. Miller, N. F.: in discussion of Falls, F. H.: AM. J. OBST. & GYNEC. **40**: 906, 1940.
19. Meigs, J. V.: in discussion of Dannreuther, W. T.: AM. J. OBST. & GYNEC. **35**: 452, 1938.
20. Counsellor, V. S.: Discussion of Dannreuther, W. T.: AM. J. OBST. & GYNEC. **35**: 452, 1938.
21. Barrows, D. N.: AM. J. OBST. & GYNEC. **31**: 156, 1936.
22. Owens, N.: Surgery **12**: 139, 1942.
23. Whitacre, F. E., and Wang, Y. Y.: Surg., Gynec. & Obst. **79**: 192, 1944.

Editorial

Again, the Rh Factor*

THE obstetrician can no longer neglect to study the recent papers which deal with the complexities of the components of the Rh factor and the several varieties of anti-Rh agglutinins and their relationship to anti-Hr agglutinins. Undoubtedly, the situation is unusually baffling for obstetricians as well as for specialists in other fields. It is, therefore, desirable to read Levine's paper which appears in this issue and in which he suggests that the clinician think only in terms of the one anti-Rh serum (diagnostic'') which detects more than 90 per cent of all persons immunized either by transfusions, pregnancies, or a combination of both factors. For the study of the 8 per cent Rh+ mothers of erythroblastotic infants, the blood specimens should be referred to specialists in the field. In any event, it becomes essential for the obstetrician to consult frequently with the serologist for the interpretation of the findings.

Another advantage in the use of the diagnostic serum—the only one available to hospital laboratories—is the fact that it enables the obstetrician to apply a simple genetic theory, rather than the involved schemes and terminologies suggested recently.

The widespread use of blood transfusions in the past twenty years has served to immunize many Rh– individuals of the female population, even as infants. Because of the long duration of the immunized state, these Rh– women may be deprived of the opportunity of having one or two normal Rh+ infants. Certainly, precautions should now be taken to transfuse all Rh– patients with Rh– blood. Undoubtedly, this will be the responsibility of all physicians and especially the pediatrician. This simple measure, by itself, should reduce slightly the incidence of erythroblastosis fetalis, especially the more severe form, and also the morbidity incidental to intra-group transfusion reactions.

On theoretical grounds, the suggestion is made that with longer intervals between pregnancies and premature induction of labor, Rh– mothers of erythroblastotic infants may still have an Rh+ infant with perhaps milder forms of the disease which can be successfully treated. It is hoped that sufficient data can be accumulated in the next few years in order to test the validity of this view.

Courses in medical genetics are gradually being introduced in the curriculum for the medical student. Powerful support for the wisdom of this step is derived from the studies on the role of the Rh factor in the pathogenesis of erythroblastosis fetalis.

*See Special Article in this issue, page 816.

American Obstetric Services

THE MARGARET HAGUE MATERNITY HOSPITAL

Jersey City, N. J.

THE Margaret Hague Maternity Hospital was built, and is operated by, the Board of Chosen Freeholders of the County of Hudson, pursuant to a special act of the Legislature of New Jersey permitting "first class" counties to so provide and operate maternity hospitals. The sole concept upon which its being is based is that the community has a responsibility in affording safe maternity care to all of its citizens of whatsoever financial capacity. Accommodations are therefore provided for both free and paying patients. The standards of essential services are uniform for all types of patients.

Situated on Clifton Place, it serves the most densely populated County of the State, with a normal population of about three-quarters of a million people, and in the thirteen and one-half years of its existence over 70,000 women have been cared for. The deficit between its receipts and its cost of operation is met out of the general tax funds of the county, this tax burden being mandatory on the County under the terms of the special act of the Legislature which established it. The hospital received its first patient on Oct. 15, 1931.

In 1940 the hospital was enlarged and completely rebuilt to permit proper organization of function in reference to the enlarged *cubage*.

The general administration resides in a Board of Managers of five members, of whom two are laymen and three are physicians as at present constituted. This Board meets regularly, and determines the broad administration policies of the hospital, subject to confirmation by the Board of Chosen Freeholders of the County of Hudson. Under its authority the executive function of the Hospital resides in a physician who functions both as Medical Director and Superintendent, with rather large discretionary powers.

The clinical work of the hospital is divided into three divisions, each headed by an Attending Obstetrician who functions as Chief of that service, being on continuous year-round service. Under broad general executive policies, each chief has autonomy relative to the details of clinical treatment and management. It is felt that this makes for a desirable diversity of practice valuable in eventual evaluation of different methods and in variety of teaching approach. Each division has a corps of from four to six assistant obstetricians. General medicine and surgery and all of their subsidiary specialties are represented by qualified members of the attending staff. The members of this auxiliary staff take an active part in consultation and the actual detailed management of clinical conditions falling within the domain of their several branches. There is a large courtesy staff, as it is felt that the hospital has a very distinct duty to the profession at large in affording the means for proper obstetric practice to the members of the profession throughout the community. The standards of practice are assured by the closest scrutiny and direction of the work of these men by the several Chiefs of Service. The house staff consists of a Chief Resident, a corps of residents, of assistant residents, and of interns. The work of all of these men and women is carefully graded so as to insure their progressive training in all phases of obstetrics. The hospital is fully approved by the American College of Surgeons, The American Medical Associa-

Fig. 1.—General view of the Margaret Hague Maternity Hospital.

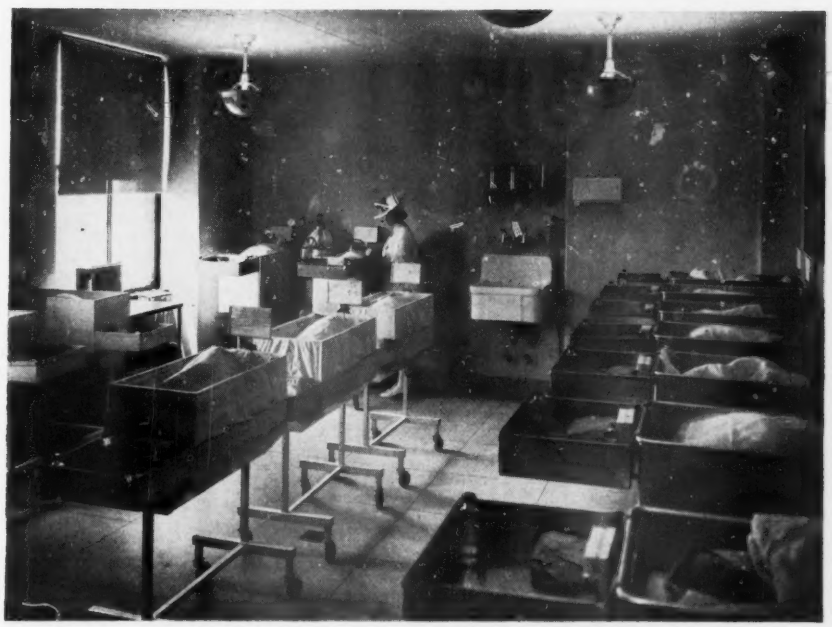


Fig. 2.—Showing arrangements in nursery.

tion, and with reference to the residencies and assistant residencies, by the American Board of Obstetrics and Gynecology.

Over one hundred contributions to medical literature have been made by members of the Staff, dealing with the work done by them in the institution.

The physical equipment is complete and modern, so departmentalized as to permit the functioning of the hospital as a completely separate and self-sufficient entity in all clinical senses. It includes facilities for nurses' training, the segregation of labor cases and cases not in labor, the complete segregation of all service to infected or potentially infected cases, complete prenatal service, abundant laboratory and x-ray facilities for all clinical needs, a blood and plasma bank, and abundant museum material, slide, library, and physical equipment for the teaching of pathology.

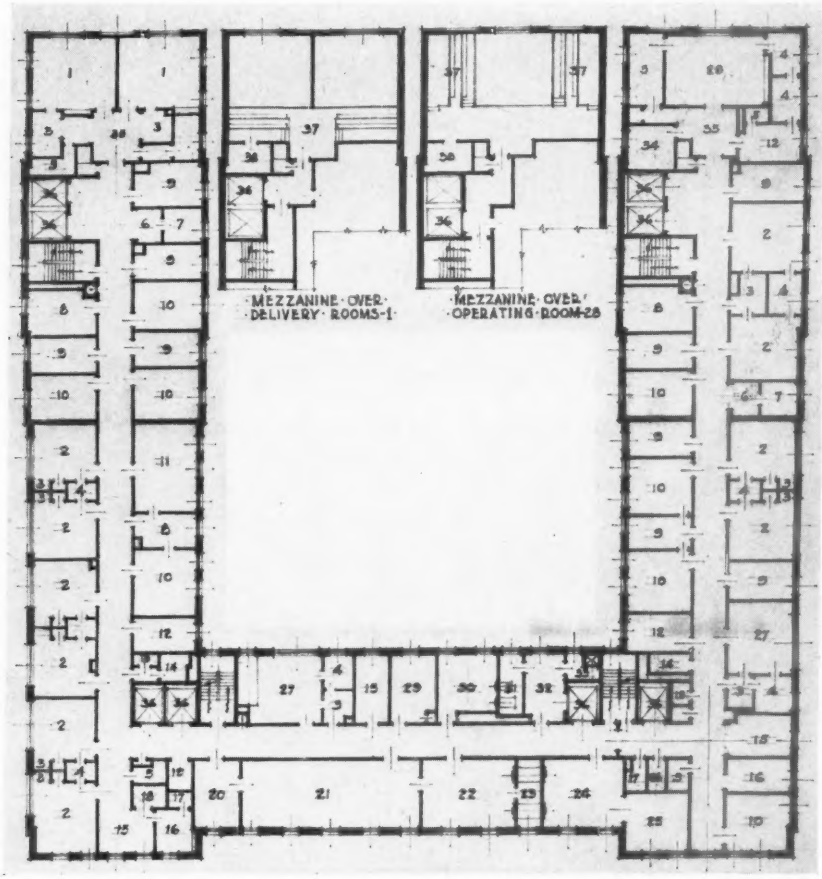


Fig. 3.—Plan of operating room floor.

1, Delivery room (amphitheater)
2, Delivery room
3, Surgeons' scrub-up
4, Sterilizer room
5, Nurses' toilet
6, Nurses' station
7, Diet kitchen
8, Nurses' workroom
9, Patients' room—1 bed
10, Patients' room—2 bed
11, Patients' room—3 bed
12, Utility room
13, Housemaids' closet
14, Male cleaners' closet
15, Nurses' office
16, Doctors' office
17, Doctors' toilet
18, Medicine preparation
19, Stretcher closet
20, Instrument and utensil wash
21, Dressing preparation
22, Drum storage (unsterile)
23, Drum sterilizers
24, Drum storage (sterile)
25, Drum storage
26, Housemaids' toilet
27, Operating room
28, Operating room (amphitheater)
29, Glove room
30, Solution room
31, Solution and glove sterilizers
32, Truck and stretcher room
33, Dumbwaiter
34, Recovery room
35, Foyer
36, Elevator
37, Observation gallery
38, Storage and coat room

The building is completely separated from all other units, except for an underground tunnel which connects it with other units of the Jersey City Medical Center.

The largest adult bed units are four-bed "wards."

Each floor nursery has a total capacity of about 60 bassinets. They are divided into three units which can be separately operated if necessary. There is also, in connection with each, a separate "observation" nursery. The latter, as well as the main "septic floor" nursery, is cubicled for maintenance of proper isolation technique.

The hospital is affiliated for graduate teaching of obstetrics with the University Extension Division of Columbia University. The hospital is affiliated with, and forms a part of, the Jersey City Medical Center, and close affiliation is maintained with the gynecologic tuberculosis, and other special and general services of that institution.

A well-organized school of nursing in obstetrics is maintained. Students consist of three groups: undergraduate affiliates, postgraduate students, and postgraduate special students pursuing extended training in ward management and supervision.

SUMMARIZED STATISTICS FOR THE FIVE YEARS, 1939 TO 1943, INCLUSIVE

Total number of beds			345
Admissions			36,590
Live births			30,844
Mortality:			
Maternal	65	(0.21 per cent)	
Fetal	730	(2.36 per cent)	
Residents, Interns, and Postgraduates			
Interns		852	
Residents		66	
Ass't residents		2	
Postgraduates (3 months)		110	
Postgraduates (1 month)		27	
			1,057
Medical Students, New York Medical College		112	
			1,169
Postgraduate Students, Nurses			
Total enrollment, Dec. 3, 1931, through 1943			1,153
Incomplete			118
Total of students completing course			1,035
Affiliate Nursing Students (Representing 9 schools)			
Total enrollment, Oct. 22, 1931, through July 31, 1944			1,353

S. A. COSGROVE, M.D.
Medical Director and Superintendent

Department of Statistics

ANALYSIS OF MORTALITIES FOLLOWING EXCISION OF THE UTERUS AT THE PHILADELPHIA GENERAL HOSPITAL, 1931 TO 1941 INCLUSIVE*

PHILIP F. WILLIAMS, M.D., PHILADELPHIA, PA.

(From the Gynecological Division of the Philadelphia General Hospital)

IN 1931, the gynecologic and obstetric staff at the Philadelphia General Hospital began a discussion at the end of each chief's service of the morbidities and mortalities of that term.

As the years have gone by, much constructive criticism was offered in these conferences. The reviews, however, were of rather short series of cases, but were of benefit because each individual death was carefully analyzed. It has seemed that a review of the mortality following one particular phase of our operative procedures would be of interest to the Society. During the years 1931 to 1941, the staff had eight chiefs, each with two or three assistants on rotating services so that the series of cases to be presented has spread throughout a large number of operators. Some cases have been recorded from a clinical standpoint, but, at no time, have our failures been collectively presented.

TABLE I. GYNECOLOGIC MORTALITY RATES

	NO.	DEATHS	MORTALITY RATE
Admissions	14,104	318	2.25
Women operated	6,372	150	2.35
Abdominal operations	2,876	103	3.56
Abdominal hysterectomies	1,870	52	2.77
Vaginal hysterectomies	88	1	1.13

During the period, 1931 to 1941 incluisve, 14,104 women were admitted to the gynecologic wards of the hospital. Of these 318 died, a mortality rate of 2.25 for the service: 6,372 women were operated on with 150 deaths, a mortality rate of 2.35. There were 2,876 laparotomies with 103 deaths, a mortality rate of 3.56. In the latter group, the uterus was removed in 1,870 cases for various indications. Of this number 52 died, a mortality rate of 2.77. The uterus was removed in 88 other cases by vaginal route with one death, a mortality rate of 1.13.

TABLE II. INDICATIONS FOR ABDOMINAL HYSTERECTOMIES

	SUBTOTAL MORTALITY RATE: 2.48		TOTAL MORTALITY RATE: 6.38	
	NO.	DIED	NO.	DIED
Tumors	1,345	36	103	8
Residues	269	5	24	0
Adnexal diseases other than inflammatory diseases	53	0	1	0
Ectopic pregnancy	34	2	1	0
Endometriosis	12	0	2	0
Miscellaneous	16	0	10	1
Total	1,729	43	141	9

*Read at a meeting of the Obstetrical Society of Philadelphia, May 4, 1944.

The indications for the abdominal hysterectomies appear in Table II. They have been grouped according to operative diagnosis or pathologic reports as tumors; residues of inflammatory conditions; adnexal disease, other than infection and inflammation; ectopic pregnancy; endometriosis; and a miscellaneous group in which several indications were, indeed, bizarre.

Vaginal hysterectomies were performed, as will be seen in Table III, for uterine descensus, procidentia, uterus partly or entirely extruded, fibroid, cystocele, cervicitis, abortion and retroversion.

TABLE III. INDICATIONS FOR VAGINAL HYSTERECTOMIES

	NO.	DIED
Prolapsed uterus	36	0
Procidentia	25	1
Fibroid	10	0
Cystocele	6	0
Cervicitis	4	0
Abortion	3	0
Retroversion	4	0
Total	88	1

The operative procedures in the abdominal hysterectomies are shown in Table IV. This includes both the subtotal and complete hysterectomies. The operative procedures in the vaginal hysterectomies are shown in Table V.

TABLE IV. OPERATIVE PROCEDURES IN ABDOMINAL HYSTERECTOMY

Hysterectomy only	638
Hysterectomy, both tubes and ovaries	891
Hysterectomy, one tube and ovary	239
Hysterectomy, additional operations	102

TABLE V. OPERATIVE PROCEDURES IN VAGINAL HYSTERECTOMY

Vaginal hysterectomy only	60
Vaginal plastic	24
Dilatation and curettage	2
Left salpingo-oophorectomy and appendectomy	1
Salpingectomy	1

In an article by John Osborne Polak,[1] he posed the question: "What Can We Learn From a Study of Mortalities?" In this review of the work at the Long Island College Hospital, he discussed their routine procedure and detailed the following minimum preoperative requisites for all elective sections, namely:

1. A complete history and general physical examination.
2. A leucocyte count of between 7,000 and 10,000.
3. A polymorphonuclear percentage of from 65 to 80.
4. A hemoglobin of at least 60 per cent.
5. A sedimentation time of 90 minutes or more.
6. A normal urinalysis, and an adequate kidney function.
7. A temperature of 98.6° F. for at least 48 hours before operation.
8. A systolic blood pressure between 110 and 150.
9. A negative Wassermann test, and finally, that all elective preoperative patients have rest in bed in the hospital for a period of at least 48 hours, during which time the intake of fluids, water, milk, etc., must be at least two and one-half quarts per diem, while the usual sugar intake of the individual must be at least quadrupled.

This list of minimum preoperative requisites was posted at the intern's desk in my gynecologic ward and I tried to have it followed,

but with many acknowledged lapses, while on service each year. I was impressed in Polak's study of his mortalities by the finding that the fatal issues reported could be attributed in a high proportion to an omission or misinterpretation of history, physical examination or laboratory procedure, or disregard of some important preoperative requisite.

Polak mentioned, too, as factors in mortality the high Trendelenburg position in hypertensives producing a cardiac embarrassment and the prolonged Trendelenburg in hypotensives predisposing to the occurrence of shock. He commented, too, on the amount of surgery done at one sitting or overreaching the maximum of safety in time consumed in operation. He particularly pointed out the necessity of preoperative bed rest, and the avoidance of operation in any case showing low grade as well as active infection. Polak evidently did not favor routine removal of the appendix during pelvic operation.

In recent years, much attention has been paid to the nutrition of the patient as a prerequisite for surgery. Probably this might be of more importance in general surgery, particularly of the intestinal or biliary regions, than in pelvic surgery. Nevertheless, the well-nourished patient withstands operation of any nature better than the debilitated one. Blood serum protein level of eight milligrams per cent is generally regarded as an index of a favorable nutritional status preceding surgery.

I have considered comparing the records of the patients who died having in mind Polak's list of prerequisites, but felt such a comparison should be delayed until sufficient time had elapsed to obtain a sample large enough to be of interest.

In reviewing the histories and physical examinations of the 53 women under discussion, it is at once admitted that every woman had a history and a physical examination. The quality of some of the histories, even in recent years, not infrequently indicated a rather sketchy statement of the symptomatology. The history or the physical findings on admission were frequently at variance with statements made after the operation had been performed. This was particularly true with regard to cardiac status. In this respect, I tried to safeguard my service by endeavoring to have the interns use the history forms proposed by Ward in the Woman's Hospital in New York, but, as the form was not printed on our history sheet, this historical and regional sequence was not always followed.

History and physical examination of these 53 patients, who died, are of particular interest with regard to the history of finding of cardiocirculatory diseases. (We have one with a history of arteriosclerosis, four with a history of hypertension, one with a history of cardiovascular disease. Two were labeled as having "arteriosclerotic hearts," one as myocardial disease, one with rheumatic heart disease, two with heart disease unspecified, and two with mitral disease.) Practically one-third had cardiac or vascular lesions.

If we turn to the subject of the white blood cell count as indicative of prolonged subacute or chronic infection, even in the case of an apparently well ambulatory patient, we find no record in eleven of the 53 histories. In 24, or nearly one-half of the cases, the leucocytes ranged between 7,000 and 10,000. There were 16 cases in which the count was above 10,000. Six of these cases died of peritonitis following operation, and six died of cardiac failure. In the two women whose leucocyte count was below 7,000, one died of shock, and the other was regarded as having had a cardiac collapse, although peritonitis was indubitably the terminal causative factor. One woman who was admitted to the hospital with a leucocyte count of 22,000 had a preoperative stay of 32 days. The last recorded leucocyte count, 18,560, was taken seven days before her hysterectomy. She died of pulmonary embolus following a thrombophlebitis of the iliac veins.

With regard to the differential count of the white cells, there is no record in eleven histories. Twenty-two women had counts between 65 to 80 polymorphonuclears. In twelve the percentage was less than 65, and in eight the percentage was above 80. In this latter group, six died of infection, peritonitis, and another of pneumonia.

Only 13 hemoglobin estimations were recorded in 53 histories. Consequently, a discussion of anemia in connection with these fatalities must necessarily be based on the 45 instances in which red blood counts were made preoperatively. If we consider a red cell count of 3,000,000 or lower, in the absence of hemoglobin estimations, as determining anemia, with its consequent lessened resistance we find ten cases with counts below 3,000,000 and five additional cases with counts below 3½ million. The influence of these anemias is reflected in the fact that eleven deaths in this group resulted from infection.

Sedimentation time was estimated on 35 cases in the series. According to the technique used, 20 were regarded as rapid. Of these eleven died from peritonitis following the operation. (In two further cases death resulted from pneumonia.)

Examinations of urine revealed albumin estimated at + to +++ in 20 instances, while in five additional instances, the presence of casts in the urine in the preoperative period is noted.

Sugar was present in preoperative specimens in three instances. There is no mention in the three histories that standardization of the diabetes had been carried out preoperatively. Two additional cases, where the glycosuria was first discovered postoperatively, had blood sugar estimations of 186 and 224. Two of the three patients, who had sugar in the urine preoperatively, had no estimations of the blood sugar while the third case had a preoperative blood sugar of 160. One of these patients died of shock, the others of peritonitis.

With regard to nitrogen retention, 12 records show a blood urea nitrogen of 16 or above, indicating a certain degree of renal damage or renal dysfunction or dehydration. The deaths in this group resulted equally from cardiocirculatory causes and infection.

The significance of low grade temperature preoperatively was stressed by Polak. He advised that in such cases operation should be postponed until the temperature reached normal, and had remained so for several days. In this series, 29 had temperatures of 99.2° F. or above, within 48 hours before operation. Of the 29, ten had temperatures of 100.2° F. or higher, in the same preoperative period. Peritonitis was the outstanding cause of death in this group.

A negative Wassermann test was regarded by Polak as an essential for an elective operation. I believe it has been felt, in the years subsequent to his paper, that syphilis plays little, if any, part in postoperative morbidity or mortality. (There were seven positive Wassermann cases, 20 per cent of such tests made. It is interesting that none of the seven positive reactions occurred in the hypertensive cases.)

In this series, there were 16 women whose blood pressure was above 150 systolic, a reading Polak gave as a minimum high point for safety in elective operations. (There were two whose pressures were less than 110 systolic.) Eight of the first group had systolic pressures from 150 to 180, and in eight the range was from 180 to 230. Five of the 16 had cardiocirculatory failure deaths. (The two highest diastolic pressures were 130 and 140. It is evident that these diastolic pressures were not actively concerned in the death, for each woman died of peritonitis; one of the diffuse type and one of the ileus type.)

In so far as bed rest in the hospital before operation is concerned, it must be remembered that the Philadelphia General Hospital, being a free service institution, is not concerned, for the most part, with a very rapid turnover of patients, and women may be held for rest in bed as long as necessary to prepare them for operation. Four women were operated on the day following their admissions. Of these, three died of

peritonitis, and one of shock. Four patients were operated on within 48 hours after their admission. Of these patients, two died of cardiac failure, one of hemorrhage and one of peritonitis.

Operative Risk

The summation of history, physical examination, pelvic findings and preoperative clinical course determines the evaluation of a woman as an operative risk. Seven records disclose a statement that the patient was a poor risk, sixteen times a doubt is expressed in the term "fair risk." Twenty were regarded as good risks; in the remaining ten, no statement is found. It was difficult to determine on many charts whether these notes, as to risk, referred to anesthesia or operation.

In but a small percentage of these records was any statement as to the need for operation. The pathology present, as described in the pelvic examination, seems to have bluntly indicated why an operation was to be done.

Jellett[2] has concisely summed up this topic. He says: "The principles relating to the necessity for operation are comparatively simple. A proposed operation is either essential or advisable; essential in that if it is not done the patient will in all probability die; advisable in that it will benefit the comfort or health of the patient. An operation may be essential, but still may not be possible owing to the state of the disease, or it may be essential and at the same time involve such risks owing to the patient's state of health that the chances of benefit are remote."

"A necessary operation to be permissible must not involve a greater risk to the patient than does the condition for which it is performed. An advisable operation, to be justifiable, must only possess risks that are negligible in comparison with the benefits that are likely to follow it."

Anesthesia

Ether was the anesthetic of choice, being used in 39 patients. In 17 of these, gas induction was used. Spinal anesthesia was used eleven times, ether was used as a supplement in three. In three cases cyclopropane was the anesthetic agent.

All the pneumonia deaths followed the use of ether. Although the association may have been an accidental coincidence, it is nevertheless, noteworthy. One anesthetic death occurred during the use of ether. Three of the five shock deaths followed the use of spinal anesthesia. Preoperative sedation, barbiturates and morphine rather than ether predisposed to the death of the one vagal hysterectomy case.

Length of Operation

Just what constitutes a safe duration of time in performing an hysterectomy is a difficult question to answer. The time must depend upon the nature and extent of pathology in the principal, as well as in the associated, lesions, and upon the ability and experience of the operator.

The average time in 42 cases, where the time of operation was recorded, was one hour and 35 minutes. Eighteen operations consumed almost exactly this time. Only four operations were performed in an hour or less. In nine abdominal cases the operating time was two hours or more, of these, three were total hysterectomies. Six had myomas, two ovarian cysts, and one a residual inflammation of the adnexa. Six died of peritonitis, two of cardiocirculatory disease and one of cerebral embolus.

The mortality in the hysterectomies done at the hospital during these 12 years varies widely according to operative procedure. Where only the uterus was removed the mortality was under one per cent (638—5). Where either both tubes and ovaries, or one tube and ovary was removed with the uterus, the mortality jumped to 3.1 and 3.3 per cent, respectively (891—28 and 239—8).

In 102 cases where other operations were combined with hysterectomy, with or without unilateral or bilateral salpingo-oophorectomy, the mortality (11 deaths) was 10 per cent. In all but a few of these 102 cases, the appendix was removed. In this mortality group, peritonitis was the cause of death in eight. The high mortality may be taken as indicating more extensive pathology than in the other groups, a greater degree of tissue trauma, too extensive surgery or infection arising from the appendiceal stump.

A few remarks might be made upon each of the eight headings in the causes of death. (Table VI.)

TABLE VI. CAUSES OF DEATH

	SUBTOTAL	TOTAL	VAGINAL
Anesthesia (died on table)	1		
Surgical shock	5		
Hemorrhage	3	1	
Embolus	4		
Peritonitis	18	6	
Cardiac-circulatory	7	1	1
Intestinal obstruction	1		
Pneumonia	4	1	
Total	43	9	1

Anesthesia

The one death during anesthesia occurred in a 45-year-old multipara vi, a Negro woman, operated upon for a large myoma producing pain. She complained, in addition, of dyspnea, ankle edema and weight loss, blood pressure was 170/100 and heart was found markedly enlarged, with some myocardia degeneration. The anesthesia, open ether, was received badly and not withstanding forced oxygen and CO_2 inhalations, the patient died as the operation ended. There was no pathologic report found, but the notes of the surgical findings state that there was some adnexal inflammation. The latter may have accounted for the 10,000 leucocytes, only count made, and temperature over 99 within 48 hours before operation.

Shock

Five cases, all operated for myoma, died of shock. One or more of these showed age of 60, leucocytosis above 10,000, rapid sedimentation time, hypertension, low hemoglobin estimation, low erythrocyte count, glycosuria, operated upon within 24 hours after admission, blood urea nitrogen of 20 mg. per cent and albuminuria. Three were regarded as poor risks, one as a fair risk, and no statement found in the last history. There can be little doubt that these five women were poor prospects for major abdominal surgery.

Hemorrhage

Four women died of hemorrhage. All had preoperative diagnosis of myoma. The first had, in addition to the myoma, an old ectopic pregnancy. After hysterectomy and partial removal of the ectopic mass, the sac was marsupialized and packed. Hemorrhage of a fatal degree followed removal of the pack.

Two of the remaining patients died within 24 hours and the fourth died on the third day after operation. Massive intra-abdominal hemorrhage occurred in two, and the other patient who had a pelvic gauze pack bled slowly but fatally, dying on the third postoperative day.

It is difficult to ascribe these deaths to any lack of preoperative requisites. There were two autopsies in this group.

Embolus

There were four deaths from embolus. In only one operation was the clamp technique used. In all of them the preoperative diagnosis was

myoma. The deaths occurred on the sixth, tenth, eleventh and thirteenth days after operation. One embolus, evidently arose from a thrombophlebitis of the iliac veins. In another, appendectomy followed an apparently routine hysterectomy. The appendix was buried in fat. Its removal was difficult and much ligation of bleeding areas was necessary. A final note by an intern advances the possibility that the appendix area was the originating point of the total pulmonary embolus.

One embolic death, following a total hysterectomy with a laboratory diagnosis of adenocarcinoma, was preceded a few hours by a numbness in the foot and subsequent muscular weakness in the leg. Death occurred the same day.

The fourth death in this group may have been a cerebral embolus or a right cerebral thrombus. The death occurred on the thirteenth day. The postoperative course had not been a septic one, and there was no hypertension. Preoperative requisites here had been well met, except for blood studies. The operating time was just over two hours, routine subtotal hysterectomy, alone for myoma. There were no autopsies in this group.

Peritonitis

There were 24 deaths from peritonitis; 18 in the subtotal and six in the total type of operation. In the group of indications termed residues, which included all inflammatory conditions of the adnexa as the chief filing diagnosis, there were five deaths, all due to peritonitis. It is probable in the case where myoma was the filing diagnosis and death resulted from peritonitis, that some residual foci of previous infection in the adnexa may have contributed to the fatal outcome.

In a group of subtotal hysterectomies, mostly with removal of both tubes and ovaries, in which death resulted from peritonitis, preoperative requisites were largely disregarded. In one or another case, there were recorded high leucocyte counts, low erythrocyte counts, high polymorphonuclear counts, preoperative fever, one-day bed rest only before operation, prolonged operating time, one operation followed in two days a colpotomy to determine the nature of a pelvic mass, hypertension, elevated urea nitrogen, and removal of appendix with an oozing pelvic cavity which necessitated a gauze pack. In two of the total hysterectomies where death resulted from peritonitis, no vaginal antisepsis had been carried out. It was stated that in one operation the vagina was opened inadvertently and a total operation was necessitated.

In almost the entire group of infection deaths, a closer analysis of the case findings and a more critical evaluation of the operative risk must have been of benefit.

The diffuse type of peritonitis occurred in a ratio of about two to one in relation to what was referred to in the histories as the ileus type of peritonitis. It is noteworthy that in three cases where the cause of death was given as paraytic ileus, definite peritonitis was found at autopsy.

Cardiocirculatory Disease

The nine deaths in this group were divided in seven myoma cases, one noninflammatory adnexal lesion (large cyst), and one prolapse of the uterus, a vaginal hysterectomy. From the cardiac standpoint, two patients had hypertension, blood pressures of 160/110 and 180/100; a third had an enlarged heart with myocardial degeneration and a blood pressure of 176/90. In the other histories, no definite lesions of the heart are recorded. The deaths in this group occurred from the second to seventh days. The patients were not febrile, postoperatively, were not recorded as having had an unusual operative blood loss, but had not met the preoperative requisites in anything like a perfect score. It is interesting to read the similarity of intern's progress notes made on histories as long as ten years apart. "Patient did not recover well after operation, heart seemed played out, pulse grew weaker, patient died."

This describes most of the group. Possibly this group represents individual inability to withstand operation. Possibly some may have been too undernourished to recover from the brunt of visceral manipulation.

Intestinal Obstruction

Although more than one of the ileus type of peritonitis deaths may actually have been intestinal obstructions, there was one case definitely due to this cause. The preoperative and filing diagnoses were myoma. Both tubes and ovaries were removed with the uterus. The preoperative findings included a leucocytosis, fever and a rapid sedimentation time. There was a typical obstruction picture from the fifth to the ninth days, with postmortem findings of ileum adherent to the cervical stump.

Pneumonia

In four patients operated on for myoma and in one operated on for residues, death resulted from lobar pneumonia in two, and bronchopneumonia in three. There were a number of cases of bronchopneumonia recorded as having occurred during the course of a fatal peritonitis; they were regarded as secondary lesions. In these pneumonia deaths, either had been the anesthetic. Lobar pneumonia developed in both instances seven days after operation in otherwise uncomplicated convalescences. The bronchopneumonia cases both followed instances where difficulty was experienced in administering the anesthetic. In one case the laryngoscope was passed during the operation. In the other, vomiting occurred during the inhalation ether anesthesia. Autopsy confirmed the diagnosis in two cases, and roentgen examination in the third.

Probably cases with perfect preoperative findings, and in excellent physical condition, might have developed similar fatal lesions. Yet, deficiencies in requisites in some respects suggest lowered resistance on one hand, and poor anesthetic risks on the other.

A review is presented of the mortalities following excision of the uterus over an eleven-year period. The indication for these operations are shown. The preoperative status of the women who died has been compared with a not too exacting set of preoperative requisites for elective gynecologic operations. The deaths have been discussed in groups by indication for operation and by causes of death.

The literature of the subject indicates a lower mortality following excision of the uterus in clinics where the staff on a continuous service has one directing head, and where a uniformity of procedure for preoperative requisites, operative technique, and postoperative treatment is closely adhered to by all operators.

With a large and loosely united staff, on short terms of service, with multiple systems of procedures, a set of standing orders for operative cases, mutually agreed upon, and covering, at least, preoperative requisites and postoperative treatment should help to lower morbidity and mortality, lessen nursing problems, and unify the training of interns and residents.

References

1. Polak, J. O., and Tollefson, D. G.: Gynecological Transactions 53: 169, 1928.
2. Jellett, H.: Gynecology, Philadelphia, 1925, Lea & Febiger, p. 436.

Special Article

RECENT DEVELOPMENTS IN ISO-IMMUNIZATION BY THE RH FACTOR

PHILIP LEVINE, M.D., LINDEN, N. J.
(From the Ortho Research Foundation)

THE observation in 1939 that fetal blood may immunize the mother—in the same way, for example, that male patients may be immunized by repeated blood transfusions—paved the way for the description of the pathogenesis of erythroblastosis fetalis.[1] In a series of papers (1941 to 1942),[2-4] evidence was produced to show that (1) erythroblastosis fetalis is the result of prolonged intrauterine reaction of maternal immune agglutinins and susceptible fetal blood, (2) at least 90 per cent of all mothers of erythroblastotic infants are Rh– and their husbands and the affected infants are Rh+, (3) in the smaller group of Rh+ mothers, finer differences within the Rh complex as well as several other blood factors other than Rh (such as the blood factor of Levine and Polayes, Hr, A, B, and perhaps others) may be responsible for iso-immunization of the mother, (4) Rh– immunized mothers can be safely transfused with Rh– blood, and (5) the chances for survival of the affected Rh+ infants of Rh– mothers are better if they are transfused with Rh– blood.

Curiously enough, the presence of anti-Rh agglutinins, which is direct proof of immunization, could be demonstrated only in about 50 per cent of the Rh– mothers even if tested soon after delivery.[3] This difficulty has now been met with the demonstration independently by Race[5] in England and Wiener[6] that many Rh– mothers of erythroblastotic infants have anti-Rh antibodies which specifically unite with and coat the surface of Rh+ blood, without inducing the visible effect of agglutination. In other words, the antibody is incomplete because only the first stage of the reaction, i.e., specific union, occurs. The specifically coated Rh+ blood is now incapable of reacting with potent anti-Rh agglutinins. Accordingly, Wiener called these "blocking" antibodies while Race used the term "incomplete" antibodies. These significant findings were soon confirmed by several workers (Diamond, Fisk and Morrow, and Levine). At any rate, it is certain that in vivo the specific reaction goes to completion so that the end result is hemolysis. In other words, clinicially, one cannot differentiate erythroblastotic infants of mothers who have anti-Rh agglutinins from those whose mothers have the incomplete antibody. By the same token, both groups of mothers are subject to severe and even fatal hemolytic reactions if they are tranfused with Rh+ blood.

Early in the work on transfusion reactions and on erythroblastosis fetalis, it was observed that not all anti-Rh agglutinins are of identical specificity.[3, 7-9] This difficulty was soon solved when it could be shown that a particular anti-Rh serum, containing but one agglutinin acting on 85 per cent of all white individuals, gave the highest value of Rh– reactions among the mothers of erythroblastotic infants.[8, 10] Levine[2] recommended a single genetic theory in order to explain the contrasting obstetric histories, i.e., either repeated or sporadic

fetal and neonatal morbidity. In the former instance, the father is homozygous (RhRh) for the Rh factor, while in the latter he is heterozygous (Rhrh).

The varieties of anti-Rh sera indicated a complex or mosaic structure of the Rh factor, but no attempt was made to present the serologic details to clinicians since one serum alone served as a diagnostic reagent to detect more than 90 per cent of all individuals immunized by either pregnancy or, by the same token, repeated blood transfusions.

Wiener,[11] in an effort to elucidate the genetic theory of the Rh complex, proposed a terminology and in rapid succession several modifications thereof. At the same time, the British workers, Race[12] and Murray,[13] suggested at least two alternative terminologies so that the present situation is utterly confusing, not only to clinicians but also to immunologists and geneticists. Very briefly stated, Levine and his co-workers had shown that two common varieties of human anti-Rh sera describe four types of bloods.[3, 8, 9] Later, Race[14] and Wiener[15] described a third variety which agglutinates the blood of 30 per cent of white individuals. This serum further divides the four types, thus making eight subtypes. Fortunately, as will be shown below, it is wiser and safer for the obstetrician and clinician to consider only the clinically most important variety which gives 85 per cent reactions in a random white population. From a practical standpoint, he must know whether his patient is Rh+ or Rh– with this serum. For this reason, it becomes necessary to identify it, and the writer would like to suggest the term "diagnostic"* anti-Rh serum.

Further support for the prominent role of the "diagnostic" anti-Rh is derived from the direct correlation of Rh– individuals in several races studied and the incidence of erythroblastosis fetalis.[8, 16] Erythroblastosis fetalis is almost unknown among Chinese, because instead of 15 per cent of Rh– individuals, as in the white race, the value among Chinese is less than 1 per cent. Such correlations cannot be obtained in corresponding studies with other varieties of anti-Rh sera.

For the exceptional 8 per cent† of the mothers who are Rh+, it is necessary for the clinician to refer the blood specimen to serologic specialists in the field. Evidence for iso-immunization in these cases can be obtained by tests with (1) blood grouping sera, (2) two other varieties of anti-Rh sera reacting with 70 per cent and 30 per cent, respectively, of white individuals, (3) anti-Hr serum,[17] and rarely, still other sera. The report in these cases can be stated as an incompatibility either of a particular blood property or due to finer differences of the Rh factor. Accordingly, it seems unnecessary, at least for the present, to urge the clinician to commit to memory a series of complex terminologies, especially when his own laboratory will have only the diagnostic serum for testing.

Until all varieties of anti-Rh sera become generally available to hospital laboratories, one may expect a very occasional intra-group transfusion accident due to iso-immunization by the Hr factor or by finer differences of the Rh factor. The rule in these cases is to select donors of the same subtypes as the immunized patient. By the same token, the erythroblastotic infants of Rh+ mothers should receive transfusions of compatible blood of the same subtype as the mother. In general, mother's blood, if incompatible, may be used for her affected infant

*This term is preferable to "standard" anti-Rh sera which refers to the experimental serum of Landsteiner and Wiener. Since this serum did not give satisfactory agglutination reactions, it was not clear whether or not it contained more than one antibody.

†The initial value of 10 per cent can probably be lowered by 2 per cent, for, in practically all cases in which the diagnosis of erythroblastosis fetalis is in doubt, the mother is Rh+. In one of Dr. Burnham's cases, it was later shown that the infant had Mediterranean (Cooley's) anemia with onset of symptoms in the neonatal period.

provided that the plasma be removed and replaced with saline or compatible plasma.

Actually, all blood specimens in selected cases (fetal and neonatal morbidity, complications of pregnancy, and intra-group transfusions reactions) should be subjected to intensive studies with all varieties of agglutinins. Since this cannot be carried out in the average hospital laboratory, the same material should be sent to qualified workers for a more intensive evaluation such as standardization of anti-Rh or other agglutinins, blocking or incomplete antibodies, and various titrations. If potent anti-Hr sera are available, tests should be made for the selection of these Rh+ fathers of erythroblastotic infants who are homozygous.[10, 18] The bloods of these individuals lack the Hr factor, and will, therefore, not be clumped by potent anti-Hr sera. The intensive study of this vast selected material should result in an increase in the supply of anti-Rh sera of all varieties. Certainly, every obstetrician is aware of the current difficulty in meeting the demands of hospital laboratories for the "diagnostic" anti-Rh serum. The situation will be much relieved as soon as potent anti-Rh sera can be produced in the experimental animal.

Obviously, it is important to determine the exact genetic behavior of the several Rh genes, but a complete theory cannot be offered unless potent specimens of the rare reagents, one variety of anti-Rh serum (30 per cent reaction in white) and the anti-Hr serum become available. Only then will it be possible to accumulate data on complete family and racial studies, the analysis of which should yield the correct genetic theory. Large scale investigations are essential since some of the subtypes are exceedingly rare.

The widespread publication of genetic schemes and terminologies for the numerous subtypes gives the clinician the wrong impression that bloods can, at all times, be classified in terms of this terminology. The fact is, however, that not even the several serologists active in this field have a constant supply of the necessary reagents for the differentiation of the several varieties of Rh+ and Rh– blood.

Undoubtedly, in time it may become necessary to adopt one of the several varieties of terminologies, but this should be decided upon preferably by an international committee as was done in the case of the four blood groups. Meanwhile, the isolated expert will perforce continue to use one of the terminologies in his own studies. However, his report to the clinician on the group of Rh+ mothers can be worded as incompatibilities detected by particular anti-Rh sera, anti-Hr sera, or blood grouping sera. Under such an arrangement, the clinician need not trouble himself with the identification of the particular variety of Rh+ and Rh– blood.

As indicated above, one may recommend to the clinician a simple genetic theory based on the behavior of the diagnostic serum, which contains but a single antibody. Accordingly, there are three genotypes, RhRh (homozygous), Rhrh (heterozygous), and rhrh (recessive). The first two represent Rh+ bloods which cannot be differentiated with anti-Rh sera. However, the Rh+ individual whose blood is not agglutinated by anti-Hr sera is homozygous for the Rh factor. A more detailed analysis which requires the use of other anti-Rh sera can be supplied by the serologic specialist.[10]

In the past three years it has become increasingly clear that once an Rh– individual is immunized, either by repeated transfusions or by pregnancies, he or she must be considered as remaining immunized for the remainder of his or her natural lifetime.[19] Thus, a woman who delivered an erythroblastotic in-

fant eleven years previously has tolerated one transfusion of Rh+ blood, but the following transfusion with Rh+ blood resulted in a violent reaction and anuria. By the same token, an Rh– woman was deprived of an opportunity of having one or two normal Rh+ children because, as a child of 6 years, she was already immunized by several blood transfusions. It is significant that in this case the first born had the most severe form of erythroblastosis fetalis, i.e., fetal hydrops. Several cases of this sort observed recently will be published in the near future.[20] Accordingly, it is necessary to consider the advisability of introducing in pediatrics the routine practice of carrying out Rh tests in all female patients to be transfused. In transfusing an Rh– female infant, it is essential to keep in mind her future pregnancies. In a broader sense, no girl or woman, regardless of age, should be transferred unless tests for Rh are carried out. Those found to be Rh– must receive only Rh– blood. With the availability of larger amounts of anti-Rh sera, such tests could be carried out in all cases, but in instances of repeated transfusions in the absence of pregnancy there is always a warning symptom of safety, i.e., a severe chill or slight jaundice which should serve as a definite indication to carry out Rh tests before another transfusion is given.

In the several reviews of the subject, no mention is made of the most significant fact that erythroblastosis fetalis establishes a precedent for fetal or neonatal morbidity attributable to a difference in a blood factor which has a normal distribution in any race. Since the blood factors involved are inherited, erythroblastosis fetalis can be considered as a disease due to genetic and constitutional causes. There already is some evidence that the antigenic factors in fetal blood other than Rh, such as A and B, may also immunize the mother with the end result of fetal and neonatal morbidity other than erythroblastosis fetalis.[21, 22]

From the very beginning of his studies, the author has stressed that the same statistical approach can be applied to any complications of pregnancy and the neonatal period.[23] Recently, Yannet[24] and Snyder[25] observed a somewhat greater incidence of Rh– reactions among 122 mothers of feebleminded infants. Further studies are required to elucidate the relationship of this group of feeblemindedness to kernicterus.

As for the mechanism of iso-immunization, it is thought that unbelievably minute amounts of fetal red blood cells in one form or another find their way into the maternal circulation in every normal pregnancy.[19] Iso-immunization occurs, however, in only a small proportion of Rh– women whose husbands are Rh+. The obstetrician is in the strategic position of being able to reassure those Rh– women who have become unduly alarmed as a result of incomplete information acquired from popular accounts in newspapers and magazines. The Rh– woman should be instructed that most of them can have two or more normal infants before they become sufficiently immunized to have an erythroblastotic infant. There is sufficient evidence to support a statement that the chances for survival of the affected infants are much better at present because the condition can be anticipated and treatment instituted promptly.

Although the silent process of iso-immunization by the fetus cannot be controlled, nevertheless the outlook for Rh– women is now much better than previously. In the first place, one can prevent the deliberate iso-immunization of the Rh– female population by transfusions with R+ blood.[26] Secondly, the blood of the pregnant Rh+ woman should be tested periodically to detect the earliest onset of iso-immunization. In general, failure to demonstrate antibodies throughout the pregnancy make it possible to give a good prognosis. If

antibodies are present and on the increase, the physician can make the diagnosis of erythroblastosis fetalis well in advance of the delivery. Premature induction of labor in selected cases in order to shorten the period of intrauterine hemolysis seems a logical procedure, but its value is still to be determined. At any rate, the affected infant should be transfused immediately with random Rh– blood via the cord vein as suggested by Mayes.[27] No further pregnancies should be recommended until after the disappearance of all residual agglutinins or incomplete antibodies produced in the previous pregnancy. In addition to this, another interval of one or more years should elapse before another pregnancy is attempted. In this manner, it is hoped to reduce the intensity of the iso-immunization in the following pregnancy. In all cases, complete blood studies of the mother, father, and surviving children, if any, should be carried out. This will make it possible to determine the genotype of the father, whether homozygous or heterozygous.

Finally, organized effort should be directed toward the training of qualified laboratory workers in the theoretical as well as practical aspects of this new and clinically important field of medicine.

References

1. Levine, P., and Stetson, R. E.: J. A. M. A. **113:** 126, 1939.
2. Levine, P., Katzin, E. M., and Burnham, L.: J. A. M. A. **116:** 825, 1941.
3. Levine, P., Burnham, L., Katzin, E. M., and Vogel, P.: AM. J. OBST. & GYNEC. **42:** 925, 1941.
4. Levine, P.: New York State J. Med. **42:** 1928, 1942.
5. Race, R. R.: Nature **153:** 771, 1944.
6. Wiener, A. S.: Proc. Soc. Exper. Biol. & Med. **56:** 173, 1944.
7. Wiener, A. S.: Arch. Path. **32:** 227, 1941.
8. Levine, P.: Science **96:** 452, 1942.
9. Levine, P.: cited by Wiener: Blood Groups and Transfusion, ed. 3, Springfield, Ill., 1942, Charles C Thomas, pp. 253-254.
10. Levine, P.: J. Pediat. **23:** 656, 1943.
11. Wiener, A. S.: Science **100:** 595, 1944.
12. Race, R. R.: Nature **153:** 772, 1944.
13. Murray, J.: Nature **154:** 701, 1944.
14. Race, R. R., et al.: Nature **152:** 563, 1943.
15. Wiener, A. S., and Sonn, E. B.: J. Immunol. **47:** 461, 1943.
16. Levine, P., and Wong, H.: AM. J. OBST. & GYNEC. **45:** 832, 1943.
17. Levine, P.: Yearbook of Pathology and Immunology, 1941, p. 508.
18. Race, R. R., and Taylor, G. L.: Nature **152:** 300, 1943.
19. Levine, P.: Arch. Path. **37:** 83, 1944.
20. Levine, P.: Unpublished data.*
21. Levine, P.: J. Hered. **34:** 71, 1943.
22. Levine, P.: West. J. Surg. **50:** 468, 1942.
23. Levine, P.: Am. J. Clin. Path. **11:** 898, 1942.
24. Yannet, H.: Bull. New York Acad. Med. **20:** 562, 1944.
25. Snyder, L. H., Schonfeld, M.D., and Offerman, E. M.: J. Hered. **36:** 9, 1945.
26. Levine, P.: Human Fertil. **9:** 68, 1944.
27. Mayes, H. W.: AM. J. OBST. & GYNEC. **48:** 36, 1944.

*In twenty-three cases of erythroblastosis fetalis in the first born, a transfusion history was obtained in sixteen instances. The chances for fetal death in the first born are ten times greater in previously transfused mothers than in the control group not transfused.

Department of Reviews and Abstracts

Review of New Books

Obstetrics and Gynecology

Dr. McCormick's monograph on the **Pathology of Labor, the Puerperium, and the Newborn**[1] is an outgrowth of his lectures at Indiana University. Although the author states that he sets forth only the essentials of present-day obstetric thought, the book is in no sense a compendium or synopsis, but gives a really fine discussion of the abnormalities which may complicate the two phases of the reproductive process. Under abnormal labor one finds an excellent discussion of the faults of the powers, passages, and passenger. While the author describes the mechanism and treatment of labor in contracted pelves, he does not mention the classification of Caldwell and Moloy. Although the teaching is undoubtedly largely personal, one enjoys the insertion of treatment recommended by heads of other institutions, which, with their bibliographic references, are inserted appropriately in the text. The discussion of obstetric injuries stresses the prophylaxis and avoidance of such complications.

Obstetric operations are discussed under twenty-four headings, and the advantages and disadvantages of many alternate procedures are succinctly phrased. The illustrations in this part of the book have been well chosen. The types, choice, and performance of cesarean section is well correlated with the previous discussion on labor in the contracted pelvis. The postoperative treatment of obstetric operations is detailed. The pathology of the puerperium comprises largely a discussion of the various types of puerperal infections and puerperal hemorrhage. The author discussed the various complications which may occur in the use of the sulfonamides and presents the most recent ideas on the use of penicillin. He recommends frequent blood transfusions in combination with either of the two agents mentioned. Nowhere in his discussion of blood transfusion as a therapeutic measure has the possibility of an Rh factor reaction been mentioned, although the subject of isoimmunization is mentioned in a short section on the pathology of the newborn. The book closes with an appendix on obstetric analgesia, several sections of which are presented by guest contributors. The author comments toward the end of this section, that continuous caudal analgesia is not suitable for general use. The subject is covered completely yet with a clarity and a conciseness which should accord a popular reception for the book.

PHILIP F. WILLIAMS.

The Abortion Problem,[2] proceedings of a conference held under the auspices of the National Committee on Maternal Health in June of 1942, covers many aspects of this involved subject. The Conference was attended by many leaders in investigative and clinical medicine as well as by members of the legal profession.

The main subjects discussed fall under four headings: magnitude of the abortion problem; spontaneous abortion and its prevention; social, moral, and economic causes and control of abortion; the control of the abortion problem.

---

[1] **Pathology of Labor, the Puerperium, and the Newborn.** By Charles O. McCormick, A.B., M.D., F.A.C.S., Clinical Professor of Obstetrics, Indiana University School of Medicine; Consulting Obstetrician to William H. Coleman Hospital for Women, Indianapolis City Hospital, and Sunny Side Sanitarium. 382 pages. 191 illustrations. Including ten in color. The C. V. Mosby Company, St. Louis. 1944.

[2] **The Abortion Problem.** Proceedings of the Conference Held Under the Auspices of the National Committee on Maternal Health, Inc., at the New York Academy of Medicine, June 19 and 20, 1942. Howard C. Taylor, Jr., M.D., Conference Chairman. 182 pages. Published for the National Committee on Maternal Health, Inc., by The Williams & Wilkins Company, Baltimore. 1944.

This report, which covers so many aspects and angles, makes evident the complexities of the subject, but as could be expected, offers little help for either combating spontaneous abortion or suppressing illegal abortion.

R. T. FRANK.

This volume is a splendid presentation of the essential information with respect to **Control of Pain in Childbirth.**[3] The book itself is excellently done on fine paper and easily readable print. The illustrations are profuse, informative, and well made. The comprehensive explanation of the anatomy involved in the use of caudal anesthesia presented together with a discussion of the neurological features should be read by every obstetrician and anesthetist. It is due to the authors' concentration on a particular subject in the field of anesthesiology that advances in this specialty are made so rapidly. Several physicians have contributed directly or indirectly to some of the material presented. Without a doubt the coverage of the subject in this book is the most complete that has yet appeared.

JOHN S. LUNDY.

The questions **The Woman Asks the Doctor,**[4] most frequently concerning the genital tract, are answered by Dr. Novak in a series of eleven chapters on the various aspects of female anatomy and menstrual and reproductive physiology. In thoroughly scientific yet easily understood diction the book traverses the whole subject of femininity from embryologic origin through the menopause, and there are additional chapters on such disturbing pathologic conditions as disorders of menstruation, malignancy, and birth control. The frank and simple manner or presentation should occasion a very frequent recommendation of this book to those patients who seem to be interested in knowing more concerning their "femaleness."

PHILIP F. WILLIAMS.

The fact that a great majority of ailments encountered in gynecologic practice are the result of infection or trauma contracted during labor has influenced the authors of this important volume, prominent teachers of the British Isles, to combine the subject of obstetrics and gynecology in one text. The present fourth edition, **A Combined Textbook of Obstetrics and Gynecology,** which is edited by Munro Kerr,[5] follows closely the arrangement of previous editions.

The editor has joined to his list of authors several contributors on specific topics. The section on Anesthesia has been written by Dr. Landau, who does not consider parasacral block sufficiently reliable for routine use. The chapter on sterility contributed by Mr. Green-Armytage is excellent, and in this edition for the first time contraception is discussed. The presentation of radiology by Mr. G. Jackson Wilson follows current practices in the United States. The use of the sulfonamides in gonorrheal and other pelvic infections is detailed. Although obstetric surgery is quite fully presented, the details of gynecologic operative technique are not given. It is the feeling of the authors that the latter is not germane to the teaching of medical undergraduates. This book is again highly recommended for medical students or general practitioners.

PHILIP F. WILLIAMS.

Dr. Greenhill's review of the literature in **The 1944 Year Book of Obstetrics and Gynecology**[6] provides a ready reference volume in which one will find a well-selected

---

[3]**Control of Pain in Childbirth.** By Clifford B. Lull, M.D., F.A.C.S., Clinical Professor of Obstetrics, Jefferson Medical College; Assistant Director, Philadelphia Lying-In Unit, Pennsylvania Hospital, and Robert A. Hingson, M.D., Surgeon, U. S. Public Health Service; Director, Postgraduate Medical Course, Philadelphia Lying-In Unit, Pennsylvania Hospital. 356 pages, 132 illustrations. J. B. Lippincott Company, Philadelphia, London and Montreal. 1944.

[4]**The Woman Asks the Doctor.** By Emil Novak, M.D., F.A.C.S., Honorary D.Sc. (Dublin), Associate in Gynecology, Johns Hopkins Medical School; Gynecologist, Bon Secours and St. Agnes Hospitals. Second edition. 130 pages. 11 illustrations. The Williams & Wilkins Company, Baltimore. 1944.

[5]**Combined Textbook of Obstetrics and Gynecology.** For Students and Medical Practitioners. Revised by J. M. Munro Kerr, LL.D., M.D., F.R.F.P. (Glas.). F.R.C.O.G., Professor Emeritus of Midwifery, Glasgow University; formerly Obstetric Surgeon, Glasgow Royal Maternity and Women's Hospital. Fourth edition. 1,169 pages. 511 illustrations, some in color. The Williams & Wilkins Company, Baltimore. 1944.

[6]**The 1944 Year Book of Obstetrics and Gynecology.** Edited by J. P. Greenhill, B.D., M.D., F.A.C.S., Professor of Gynecology, Cook County Graduate School of Medicine. The Year Book Publishers, Chicago. 1945.

discussion of recent articles dealing with the principle topics of the two specialties. The editor has included a great deal of material on continuous caudal analgesia, but states in his comment at the end of the section that he is even more convinced than he was a year ago that continuous caudal analgesia will not become part of our obstetric armamentarium. There are many references to the present status of the sulfonamide group of drugs in both puerperal and nonpuerperal pelvic infections. There is a long review of the literature on endocrinology, and the editor notes the narrowing indications for the use of various hormones. The few articles which have appeared on penicillin are reviewed and its efficacy is compared with that of the sulfonamides. The volume offers an opportunity for a rapid review of the present status of research and therapy in these specialties.

PHILIP F. WILLIAMS.

An elaborate monograph on **Leukoplakia of the Vulva** is published by Octaviano Alves De Lima Filho.[7] This is based on nine cases of leucoplakia as well as leucoplakic kraurosis seen by the author in 1,186 patients, which is a percentage of 0.67 per cent. He believes that leucoplakia shows a marked preference for the white race. Syphilis and estrogenic insufficiency appear to play an etiological role. The author mentioned the many theories and hypotheses which have been proposed, covering such possibilities as allergy, avitaminosis, etc. There are a number of beautiful gross colored photographs as well as many illustrations of microscopic sections, and a rather full consideration of the literature. In spite of its completeness and accuracy, the monograph presents nothing new.

R. T. FRANK.

Endocrinology

Endocrinology of Woman by Hamblen[8] may be considered a second edition, entirely rewritten, of his *Endocrine Gynecology* which appeared five years ago. The book is large, ambitiously planned, well executed, requiring an immense amount of garnering of the literature, codification, and interpretation. Its fifty-two chapters reflect the large clinical and thorough laboratory experience of the author.

Eighty-five pages are devoted to consideration of the separate endocrine glands, their embryology, anatomy, chemistry, physiology, etc. The testes are included. Although brief, the presentation is accurate, modern, and up to date. The chemistry is clear and understandable. Part two deals with the female sex function from the fetus through the climacteric. I know of no other book which contains as ample, clear-cut, and well-collated a summary of our knowledge of this phase of the subject in such short compass.

Diagnostic methods are considered in the third section. This includes anthropometric, pelvic, histologic (biopsy, spreads), bacteriologic, chemical, and hormonal investigations and methods, briefly, but in detail. Accompanying tables and charts are valuable for ready reference. Part four covers functional disorders of the endocrine glands. The chapter on adrenal diseases is especially satisfactory. In functional ovarian disease, Hamblen describes "hypoprogestinism" which, in my opinion, does not as yet warrant classification as a disorder.

Part five deals with endocrinology applied to gynecologic diseases. It includes abnormal skeletal growth, abnormal sex differentiation, obesity, and leanness. Uterine bleeding, pregnancy complications, dysmenorrhea, sterility, the climacteric. In addition, dermatologic abnormalities, breast and other cyclic disturbances are described. The classification of uterine bleeding is too involved, its treatment too schematic.

This book can be used as a source for endocrine literature. Between the footnotes and chapter bibliographies, much ground is covered. The author has experience and entertains opinions which he does not hesitate to express. Occasionally I must differ with him categorically, as for instance when he declares that "the Friedman test has been found to be positive in many nonpregnant conditions," and that "the author believes

---

[7] **Leucoplasia Vulvar.** By Octaviano Alves de Lima Filho, Assistent efetivo da Clinica Ginecólogia da Escola Paulista de Medicina. Laureado pela Acadêmia Nacional de Medicina com o prêmio "Madame Durocher" em 1942. 240 pages. Livraria Atheneu—Jose Bernades, Sao Paulo, Brazil. 1944.

[8] **Endocrinology of Woman.** By E. C. Hamblen, B.S., M.D., F.A.C.S., Clinical Professor of Endocrinology and Associate Professor of Obstetrics and Gynecology, Duke University School of Medicine; Chief of the Endocrine Division and Endocrinologist, Duke Hospital, Durham, N. C. 571 pages. Charles C Thomas, Springfield, Ill. 1945.

the Aschheim-Zondek test is more reliable . . . .'' Also that ''the comb response of the baby chick . . . [is] too unreliable for assay use.'' All in all, however, this endocrinology is a valuable contribution, useful to both endocrinologist and gynecologist.

R. T. FRANK.

The fifth edition since 1933 of **Recent Advances in Endocrinology** by Cameron[9] has appeared. In order to conserve space, it has been almost completely rewritten. In this edition, the clinical aspects have received greater emphasis. The literature is dealt with until the end of 1943. This volume differs from the so-called year books in that it gives access to the newer publications and discoveries, but does not describe them in a haphazard fashion. This is achieved by describing the history as well as the entire aspect of each subject taken up.

The chapter on the steroid hormones and related compounds is unusually detailed, clear, and satisfactory. The same may be said for the chapter on Cushing's disease and adrenocortical syndromes. This does not signify that the other chapters are not satisfactory. On the contrary, this book makes very interesting and instructive reading and is well worth while for those who try to keep abreast of newer discoveries in a general fashion, and is sufficiently detailed to interest those who specialize in the subject.

R. T. FRANK.

Von Wattenwyl[10] has produced a faultlessly gotten up monograph on the effect of prolonged application of estrogens. The main theme is the implantation of tablets of natural and synthetic estrogens in guinea pigs and other rodents. The material is not very extensive but the methods are careful and well executed. In the main, these experiments are repetition and confirmation of the work performed by others, particularly by Lipschitz of Chile. The observation that prolonged treatment with estrogens caused transient alopecia is new.

This monograph serves as an excellent review of all phases of the subject dealt in.

R. T. FRANK.

Miscellaneous

Outline of the Amino Acids and Proteins,[11] edited by Sahyun, and with twelve additional contributors, some engaged purely in research, others connected with research and industry, is a fascinating monograph. This book can be read, perhaps with a trifle of difficulty, by the average physician as well as the chemist. It covers the discovery of the individual amino acids, which really is a romantic chapter in research. The tremendous amount of work that has been put on this subject for the last one hundred years is beginning to give results. The formation of protein by linkage of the amino acids, their grouping according largely to physical properties, especially to solubilities, is taking more and more definite shape. The investigation of the simple proteins, such as the albumins, globulins, prolamines, histones, and protamines, is very definite. Less advanced, of course, is our knowledge of the conjugated proteins, that is, those combined with prosthetic groups of nonprotein nature. Some of the most important biologic compounds fall in this group, such as hemoglobin, coenzyme, yellow enzyme, and nucleoproteins, including the viruses. In this large group fall the chromoproteins, glycophosphoproteins, as well as the endocrine proteins. In the latter, we may put thyroglobulin, insulin, prolactin, covering those which have been obtained in crystalline form. In the study of the proteins, the size of the molecule, the surface films, the nature and effect of hydrolysis, the more successful and intricate syntheses are playing a greater role.

It is impossible in a review to give more than the barest idea of the tremendous amount of knowledge, some of it still in the hypothetical and borderline state, which

---

[9]**Recent Advances in Endocrinology.** By A. T. Cameron, M.A., D.Sc. (Edin.), F.R.I.C., F.R.S.C., Professor of Biochemistry, Faculty of Medicine, University of Manitoba; Biochemist, Winnipeg General Hospital. Fifth edition, with 73 figures, including three plates. 415 pages. The Blakiston Company, Philadelphia. 1945.

[10]**Tierexperimentelle Untersuchungen über die Wirkung langdauernder Follikelhormonapplikation und die Hormonale Tumorentstehung.** Von Dr. Hubert Von Wattenwyl, Privatdozent Oberarzt am Frauenspital Basel. 235 pages. Benno Schwabe & Co., Basel, Switzerland. 1944.

[11]**Outline of the Amino Acids and Proteins.** Edited by Melville Sahyun, M.A., Ph.D., Vice-President and Director of Research, Frederick Stearns and Company, Detroit, Michigan. Contributing Authors: Henry B. Bull, William M. Cahill, Herbert E. Carter, David M. Greenberg, Michael Heidelberger, Irving R. Hooper, Carl L. A. Schmidt, C. F. Kade, Armand J. Quick, Melville Sahyun, Arthur H. Smith, Madelyn Womack, and Dean Laurence. 251 pages. Reinhold Publishing Corporation, New York. 1944.

will be found in its pages. This book is really illuminating to the physician who has not had the opportunity of following the rapid increase in knowledge. It is probably indispensable to the chemist, both the student and the practicing one.

R. T. FRANK.

Dr. Oberndorf has undertaken the fascinating task of presenting **The Psychiatric Novels of Oliver Wendell Holmes,**[12] in abridged form, with an introduction and with many annotations. He has succeeded in interesting a large audience as shown by the fact that since 1943 this book has undergone three printings.

It has been the fashion fairly recently to somewhat minimize the achievements of Oliver Wendell Holmes because of his flamboyance, his activities in political medicine, and his delight in personal advertisement. However, nobody can remove from him the immense credit of having discovered the contagiousness of "puerperal fever," and second, nobody can decry his uncanny insight into the psychological sphere as evidenced by the three novels which Dr. Oberndorf has abridged. *Elsie Venner* is a story of a schizophrenic. *The Guardian Angel* presents hysteria in a young girl. *A Mortal Antipathy* is a young man's morbid fear (gynophobia).

Oberndorf is fully justified in considering Holmes as a precursor of Freud. The novels were meant to show that there is no inherited guilt. Holmes realized that dreams are battles with ourselves, unconscious that we are our own antagonists. He likewise understood that automatic unconscious actions of the minds enter into the thought mechanism. He realized the force of childhood memories; the effect of sexual frustrations in producing physical symptoms. Oberndorf points out the salient factors that the casual, even the medical reader, might overlook. He emphasizes, for example, that all of the major characters lost their mothers before the age of two. His footnote annotations are modern keynotes to Holmes's text. This book makes delightful and instructive reading and should put *Elsie Venner* and *The Guardian Angel* particularly, into the reading of the younger generation who had been frightened off by Holmes's somewhat prolix style which has been removed by the abridgement.

R. T. FRANK.

Criep has written **Essentials of Allergy**[13] as the fifth in the series of Lippincott's *Essentials*. The book is designed for both the practitioner and the medical student as a working manual in outline form. The subject is certainly important because 10 per cent of the population suffers from major allergies and up to 50 per cent from minor allergies. The principles of immunology are carefully but briefly gone into, and then their clinical application is given. In each chapter there are many case histories and each chapter is concluded with a bibliography. A fairly complete dietary, designed to avoid certain foodstuff, is included, as well as many tables and good illustrations. This manual is well written, sound, and should prove of real use, particularly to those who are interested chiefly in direct clinical application.

R. T. FRANK.

The fourth edition of Kolmer and Boerner's **Approved Laboratory Technic**[14] appears after an interval of four years. Thirty collaborators were enlisted to cover the enormous amount of detail which today is embraced by the term of clinical pathology. The contents does not lend itself to detailed review. It includes not only clinical pathology

---

[12]**The Psychiatric Novels of Oliver Wendell Holmes.** Abridgment, Introduction, and Annotations by Clarence P. Oberndorf, M.D., Clinical Professor of Psychiatry, Columbia University. 268 pages. Columbia University Press, New York. 1943.

[13]**Essentials of Allergy.** By Leo H. Criep, M.D., Assistant Professor of Medicine and Lecturer in Immunology, School of Medicine, University of Pittsburgh, Diplomate in Internal Medicine (1937), Fellow of the American Academy of Allergy, Chairman, Department of Medicine, Montefiore Hospital and Senior Staff in Medicine, Presbyterian and Passavant Hospitals, Pittsburgh, Consultant in Allergy to the Medical Service of the U. S. Veterans Administration. With a Foreword by Robert A. Cooke, M.D., Chairman, Committee on Education, American Academy of Allergy. 42 illustrations in black and white and 1 plate in full color. 381 pages. J. B. Lippincott Company, Philadelphia. 1945.

[14]**Approved Laboratory Technic.** Clinical Pathological, Bacteriological, Mycological, Virological, Parasitological, Serological, Biochemical and Histological. By John A. Kolmer, M.S., M.D., Dr. P. H., Sc.D., LL.D., L.H.D., F.A.C.P., Professor of Medicine in the School of Medicine and the School of Dentistry, Temple University; Director of the Research Institute of Cutaneous Medicine; Formerly Professor of Pathology and Bacteriology, Graduate School of Medicine, University of Pennsylvania, and Fred Boerner, V.M.D., Associate Professor of Clinical Bacteriology, Graduate School of Medicine and Assistant Professor of Bacteriology, School of Medicine, University of Pennsylvania; Bacteriologist, Graduate Hospital, Philadelphia. Fourth edition. 1,017 pages. D. Appleton-Century Company, Inc., New York. 1945.

but also bacteriology, mycology, virology, parasitology, serology, biochemical and histological techniques. A section on hormonology—pregnancy, estrin, and gonadotropic tests—has been added. It is rather sketchy. The determination of penicillin and the sensitivity of bacteria to this drug are included. Many additions and changes have been made which bring the useful and important book fully up to date.

R. T. FRANK.

This is an objective study of the relationship of the basic sex differences to the behavior patterns in men and women.[15] In making this study of the fundamental differences in thought, temperament and activities of the two sexes, Dr. Scheinfeld has investigated many theories, has exhaustively analyzed the literature, and has consulted experts in the various problems of this study. Beginning with embryologic formation, he proceeds through the development of infancy and adolescence, and discusses the modifying influence of physical and sexual factors, in the transition from puberty to maturity. The psychological development, the variances in sex attitudes, and the influence of the divisions of labor in the male and female bring out many points of interest. Discussing relative achievement and genius in the two sexes, he portrays with considerable finesse the inhibitory barriers which formerly restrained equality in various fields. This chapter is an excellent study of the career woman.

The book is extensively documented, with many tables and illustrations and, while the author's philosophy is somewhat extended, the book is interesting reading on the psychological influence of the biological factors on the character of sexes.

PHILIP F. WILLIAMS.

This book **Psychology of Women** by Dr. Deutsch[16] is offered as the first volume of a two-part study. The present volume carries the process of development of the female psyche across the threshhold of maturity. Dr. Deutsch states that the second part will deal with the salient life phases of adult womanhood.

This psychoanalytic interpretation is a clinical study of why women act a certain way, and is an attempt to explain the normal psychology of women and their conflicts. The text is offered in ten chapters, and discusses three distinct although related themes. The early chapters deal with the development of the psychology of a young girl, a development that is closely associated with menstruation. Dr. Deutsch regards this period as the one in which the foundations of feminine personality are definitely formed. In succeeding chapters she discusses the three essential traits of femininity: narcissism, passivity, and masochism. These essential traits are thoroughly amplified by clinical instances. The variances from such essential traits are discussed in relation to the factors, physiologic, sexual, or social which produce either the nonfeminine or, further, the masculine type of woman. Those who are interested in the various abnormal types of psychological development or behavior in women will find much of value in this text.

PHILIP F. WILLIAMS.

Dr. Groves, in **The American Woman,**[17] discusses woman's changing status in the United States and stresses her advance toward equality with men. From a background of woman's earlier position and her situation in Europe prior to the seventeenth century, he develops the changing cultural background of woman. As to the American woman, he portrays her position in colonial days, and her life and work on the frontier in the expansion of our domestic economy. The modifying geographic influence on women in the North and South and of the continued expansion of our country to the West forms a large section of the text, and gives a graphic picture of the social and political changes in the various parts of our country during the period from the Revolution to the Civil War. He discusses the American woman as a single unit in the period after the Civil War, with reference especially to her educationally improved position and her beginning

[15] **Women and Men.** By Amram Scheinfeld. 402 pages. Harcourt, Brace and Company, Inc., New York. 1944.

[16] **The Psychology of Women.** A Psychoanalytic Interpretation. By Helene Deutsch, M.D., Associate Psychiatrist, Massachusetts General Hospital Lecturer, Boston Psychoanalytic Institute. Foreword by Stanley Cobb, M.D., Bullard Professor of Neuropathology, Harvard University. Volume One. 386 pages. Grune & Stratton, Inc., New York. 1944.

[17] **The American Woman.** The Feminine Side of a Masculine Civilization. By Ernest R. Groves, Professor of Sociology, University of North Carolina. Second edition. 424 pages. Emerson Books, Inc., New York. 1944.

participation in industry. Discussion of the past four decades portrays woman's part and influence in many social changes of this period, such as suffrage, the prohibition question, child welfare, and the employment of women and children in industry. The latter portion of the book discusses the changing status of women just prior to and during our war years, as well as her participation in World War II. The book is an interesting and complete contribution to the life and problems of the American woman and presents many implications of interest to those who are concerned in her health.

PHILIP F. WILLIAMS.

This small volume **Medical Uses of Soap**[18] is a collection of articles on the chemistry, manufacture, and the usual and the abnormal and the therapeutic effects of soap on normal and diseased skin. There are chapters regarding the use of soap on the hair and in shaving and a consideration of its use in prophylaxis as well as therapy of various diseases. There is much in the book which could be useful to the industrial surgeon, dermatologist, or the family physician.

PHILIP F. WILLIAMS.

[18] **Medical Uses of Soap.** A Symposium. Edited by Morris Fishbein, M.D. 178 pages. J. B. Lippincott Company, Philadelphia. 1945.

Correspondence

Relaxation of Constriction Ring With Adrenalin Chloride in a Cesarean Section Under Spinal Anesthesia

To the Editor:

In November, 1943, under *Correspondence* in the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, I reported a case "Relaxation of Bandl's Contraction Ring With Adrenalin Chloride" in a cesarean section under spinal anesthesia. This anesthesia being uniform in its effect ruled out the fact that the deepening anesthesia (Brown and Wilder, April, 1943, AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY) caused the relaxation rather than the adrenalin chloride.

Within the past year I had another opportunity to observe the same phenomenon in the case reported below. The operator and his assistant were both skeptical, so no comment was made by me when the relaxation began to occur, but when it did occur they admitted it to be a fact. In this case disproportion made a cesarean section necessary, but if adrenalin chloride (unless otherwise contraindicated) was used in every case of even suspected constriction ring, it would cause no harm and might prevent many unnecessary cesarean sections. Two cases of anything are a small number to report but planned experiments could not have been more conclusive proof of the ability of adrenalin chloride to relax a constriction ring.

A 27-year-old Negro woman pregnant for the first time was admitted to the hospital in hard labor with the history of having been in labor for the past five days. The membranes were said to have ruptured three days before. X-ray showed a large baby and a small pelvis.

With a living baby, no cervical dilatation, the patient in good condition, and definite cephalopelvic disproportion, a cesarean section was considered indicated. A single shot spinal with ephedrine was the anesthesia used. When the uterus was exposed, the constriction ring was very prominent in the upper segment of the uterus. Five minims of adrenalin chloride were given subcutaneously and within four minutes relaxation had begun and was apparently complete within another minute. A 12-pound living male infant was delivered. The constriction ring was about the baby's hips and was tight enough to cause an ecchymotic ring just above the hips and back (a Negro baby is light in color).

The mother's recovery was uneventful and both left the hospital in good condition on the fifteenth day.

ADAM T. THORP, M.D.

ROCKY MOUNT, N. C.
MARCH 20, 1945.

Items

American Board of Obstetrics and Gynecology

Examinations

The general oral and pathology examinations (Part II) for all candidates will be conducted at Atlantic City, New Jersey, by the entire Board from Wednesday, June 13, through Tuesday, June 19, 1945. The Hotel Shelburne in Atlantic City will be the headquarters for the Board. Formal notice of the exact time of each candidate's examination will be sent him several weeks in advance of the examination dates. Hotel reservations may be made by writing direct to the Hotel.

Candidates for *re-examination* in Part II must make written application to the Secretary's Office not later than April 15, 1945.

The Office of the Surgeon General (U. S. Army) has issued instructions that men in Service, eligible for Board examinations, be encouraged to apply and that they may request orders to Detached Duty for the purpose of taking these examinations whenever possible.

Candidates in Military or Naval Service are requested to keep the Secretary's Office informed of any change in address.

Deferment without time penalty under a waiver of our published regulations applying to civilian candidates, will be granted if a candidate in Service finds it impossible to proceed with the examinations of the Board.

Applications are now being received for the 1946 examinations. For further information and application blanks, address Dr. Paul Titus, Secretary, 1015 Highland Building, Pittsburgh (6), Pennsylvania.

PAUL TITUS, M.D.

Announcement

In compliance with the directives imposed by the War Production Board limiting the amount of paper consumed in the production of this JOURNAL, the publishers find it necessary to change the format. As soon as these restrictions are lifted the original format will be restored. Even though the number of pages has been reduced, the actual content of the JOURNAL has not been decreased to any appreciable extent.

INDEX TO VOLUME 49

AUTHORS INDEX*

A

AABERG, MONRAD E., AND REID, DUNCAN E., Manual removal of the placenta, 368
ABARBANEL, A. R., The spasmolysant action of magnesium ions on the tetanically contracting human gravid uterus, 473
ABEL, STUART, Androgenic therapy in malignant disease of the female genitalia, 327
ADAIR, FRED L. (WITH HESSELTINE, H. CLOSE, HAC, LUCILE R., AND HIBBS, DONALD K.), Sulfonamide therapy in gonococcal infection in women, 746
ALLEN, EDWARD A., Pregnancy and otosclerosis, 32
ANDERSON, HARLEY E., Torsion of apparently normal ovary, and spontaneous amputation of Fallopian tube during adolescence, 283
ARNELL, RUPERT E., A therapeutic regimen for eclampsia, based on a personally conducted series of 142 consecutive cases without a maternal fatality, 49
ASHER, HYMAN A. (WITH SPEISER, MORTIMER D., WEXLER, GERTRUDE, AND THOMAS, EVAN W.), The rapid treatment of early syphilis during pregnancy, 214
AUERBACH, S. H., AND PUND, EDGAR R., Squamous metaplasia of the cervix uteri, 207
AYRE, J. ERNEST, Adenoacanthoma of uterus, 261

B

BATEMAN, E. J., Unusual sequel to attempted criminal abortion, 280
BERLIND, MELVYN, The differential diagnosis between fetal and maternal heart rate, 703
BROWN, J. BRUCE (WITH POTTER, MILTON G., AND ERVING, HENRY W.), Observations on breech deliveries in a general hospital, 567

C

CASHMAN, B. Z., Hysterectomy with preservation of ovarian tissue in the treatment of endometriosis, 484
—, The prevention of cancer of the cervix, 190
CHARIPPER, HARRY A. (WITH GOLDSMITH, E. D., AND GORDON, ALBERT S.), an analysis of the effects of continued thiourea treatment in pregnancy and on the development of the offspring in the rat, 197
CHEN, C. Y. (WITH WHITACRE, FRANK E.), Surgical treatment of absence of the vagina. Report of two cases, 789
CINBERG, BERNARD L., Postmenopausal pruritus vulvae, 647
COHN, ALFRED, TAYLOR, HOWARD C., JR., AND GRUNSTEIN, ISAAK, Penicillin treatment of sulfonamide-resistant gonococcal infections in the female, 657
COOKE, WILLARD R., The differential psychology of the American woman, 457
CUMMINGS, WILLIAM G., A study of maternal morbidity, 409

D

DAILY, EDWIN F., Maternity care in the United States—planning for the future, 128
DIECKMANN, WILLIAM J., Chicago Lying-in Hospital, 704
DOWNING, GEORGE C., MILLER, MARCIA, AND DURFEE, R. B., The catheter method for continuous caudal anesthesia, 391
DOYLE, LEO W. (WITH MUSSEY, ROBERT D., AND RANDALL, LAWRENCE M.), Pregnancy following myomectomy, 508
DURFEE, R. B. (WITH DOWNING, GEORGE C., AND MILLER, MARCIA), The catheter method for continuous caudal anesthesia, 391

E

EASTMAN, NICHOLSON J., Report on an English national maternity service, 285
EDMONDSON, HUGH A., LEVI, LEO M., EVANS, NEWTON, AND HORN, PAULA, Papillary lesions of the cervix uteri in pregnancy, 356
ERVING, HENRY W. (WITH POTTER, MILTON G. AND BROWN, J. BRUCE), Observations on breech deliveries in a general hospital, 567
EVANS, NEWTON (WITH EDMONDSON, HUGH A., LEVI, LEO M., AND HORN, PAULA), Papillary lesions of the cervix uteri in pregnancy, 356
EVERVETT, HOUSTON S., SCOTT, ROGER B., AND STEPTOE, PHILIP P., JR., The treatment of urinary infections with sulfasuxidine (succinylsulfathiazole), 114

F

FAULKNER, ROBERT L., An injection study of uterine blood vessels, 1
— (WITH MELODY, GEORGE F., AND STONE, SIDNEY J.), Adenoacanthoma of the ovary), 691
FIELDS, HARRY, The influence of stilbestrol upon lactation, 385
FINDLEY, DAVID, End results in the treatment of cervicitis, 614
FINN, WILLIAM F. (WITH KUDER, KATHERINE), Therapeutic interruption of pregnancy, 762
FITZGERALD, J. E. (WITH KOBAK, ALFRED J., FREDA, VINCENT C., AND RUDOLPH, LOUIS), Carcinoma of the cervix and pregnancy, 307
FORTIER, G. M. A., Benefit from early clamping of umbilical arteries, 304
FRANK, ROBERT T., Postoperative vesicouterine fistula, 776
FREDA, VINCENT C. (WITH KOBAK, ALFRED J., FITZGERALD, J. E., AND RUDOLPH, LOUIS), Carcinoma of the cervix and pregnancy, 307
FREE, EUGENE G., Five hundred consecutive cesarean section operations, 401

G

GILL, JOHN JOSEPH, Fetus adipocere monster, 440
GOLDSMITH, E. D., GORDON, ALBERT S., AND CHARIPPER, HARRY A., An analysis of the effects of continued thiourea treatment in pregnancy and on the development of the offspring in the rat, 197
GOODALL, J. R., Uterine defense mechanism against infection, 532
GORDON, ALBERT S. (WITH GOLDSMITH, E. D., AND CHARIPPER, HARRY A.), An analysis of the effects of continued thiourea treatment in pregnancy and on the development of the offspring in the rat, 197
GRABER, EDWARD A., Thoracopagus twins—x-ray diagnosis, 276
GREENBERG, EMANUEL M., A rectal maneuver for placental delivery, 700

*January, pp. 1-158; February, pp. 159-306; March, pp. 307-454; April, pp. 455-602; May, pp. 603-718; June, pp. 719-822.

GRUNSTEIN, ISAAK (WITH COHN, ALFRED, AND TAYLOR, HOWARD C., JR.), Penicillin treatment of sulfonamide-resistant gonococcal infections in the female, 657
GUSTAFSON, GERALD W., The management of abruptio placentae, 103
GUTTMANN, EUGEN, A new self-retaining vaginal retractor, 436

H

HAC, LUCILE R. (WITH HESSELTINE, H. CLOSE, ADAIR, FRED L., AND HIBBS, DONALD K.), Sulfonamide therapy in gonococcal infection in women, 746
HAMAN, JOHN O., Exercises in dysmenorrhea, 755
HERTIG, ARTHUR T. (WITH RUTHERFORD, ROBERT N.), Noninvolution of the placental site, 378
HESSELTINE, H. CLOSE, HAC, LUCILE R., ADAIR, FRED L., AND HIBBS, DONALD K., Sulfonamide therapy in gonococcal infection in women, 746
HIBBS, DONALD K. (WITH HESSELTINE, H. CLOSE, HAC, LUCILE R., AND ADAIR, FRED L.), Sulfonamide therapy in gonococcal infection in women, 746
HORN, PAULA (WITH EDMONDSON, HUGH A., LEVI, LEO M., AND EVANS, NEWTON), Papillary lesions of the cervix uteri in pregnancy, 356
HUBER, CARL P., The failure of the conservative treatment of eclampsia, 81
HUDGINS, A. P., X-ray studies in hysterosalpingography, using a new cannula, 431
HUGHES, EDWARD C., Relationship of glycogen to problems of sterility and ovular life, 10
HUNT, ARTHUR B., Massive obstetric hemorrhage requiring hysterectomy, 246
HUTTER, ADOLPH M., AND PARKS, JOHN, The transmission of penicillin through the placenta, 663

J

JOHNSTON, ROBERT A., A critical analysis of twenty-two years' experience with cesarean section, 576
JONES, CHARLOTTE A., NEUSTAEDTER, THEODORE, AND MACKENZIE, LOCKE, L., The value of vaginal smears in the diagnosis of early malignancy, 159

K

KANTER, A. HERBERT, Bilateral, multilocular, pseudomucinous cysts of ovaries necessitating cesarean section, 428
KOBAK, ALFRED J., FITZGERALD, J. E., FREDA, VINCENT C., AND RUDOLPH, LOUIS, Carcinoma of the cervix and pregnancy, 307
KUDER, KATHERINE, AND FINN, WILLIAM F., Therapeutic interruption of pregnancy, 762

L

LEFF, MORRIS, Continuous caudal analgesia, 717
—, The comparative action of posterior pituitary and ergonovine in the third and fourth stages of labor. Observations based on 5,000 deliveries, 734
LEVI, LEO M. (WITH EDMONDSON, HUGH A., EVANS, NEWTON, AND HORN, PAULA), Papillary lesions of the cervix uteri in pregnancy, 356
LEVINE, PHILIP, Recent developments in isoimmunization by the Rh factor, 810
LEVINE, WILLIAM, AND WEINER, SAMUEL, Carcinoma following pregnancy with spontaneous cure, 778
LYNCH, FREDERICK J., Rupture of the uterus, 514

M

MACKENZIE, LOCKE L. (WITH JONES, CHARLOTTE A., AND NEUSTAEDTER, THEODORE), The value of vaginal smears in the diagnosis of early malignancy, 159
MARGULIES, LAZAR, Omphalocele (amniocele). Its anatomy and etiology in relation to hernias of umbilicus and the umbilical cord, 695
MAXWELL, ALICE F., In memoriam—Frank Worthington Lynch, 455
MEIGS, JOE V., The Wertheim operation for carcinoma of the cervix, 542
MELODY, GEORGE F., FAULKNER, ROBERT L., AND STONE, SIDNEY J., Adenoacanthoma of the ovary, 691
MENGERT, WILLIAM F., AND STOLTZ, RODNEY, Total abdominal hysterectomy, 603
MILLER, JAMES R., Prolapse of the urethra treated by the Hepburn operation, 591
MILLER, MARCIA (WITH DOWNING, GEORGE C., AND DURFEE, R. B.), The catheter method for continuous caudal anesthesia, 391
MOE, RUSSELL J., Duplication of right kidney pelvis and ureter with extravesical ureteral opening, 641
MORTON, DANIEL G., Pelvic lymphadenectomy in the treatment of cervical cancer, 19
MULL, J. W. (WITH SIDDALL, A. C.), Thiamin status during pregnancy, 672
MULSOW, FREDERICK W., Pregnancy in rudimentary horn of the uterus, 773
MURPHY, DOUGLAS P., The role of the intermittent contractions of the uterus in the process of labor, 186
MUSSEY, ROBERT D., RANDALL, LAWRENCE M., AND DOYLE, LEO W., Pregnancy following myomectomy, 508

N

NECHTOW, MITCHELL J. (WITH REICH, WALTER J.), Cystic pelvic chordoma simulating an ovarian cyst, 265
NEUSTAEDTER, THEODORE (WITH JONES, CHARLOTTE A., AND MACKENZIE, LOCKE L.), The value of vaginal smears in the diagnosis of early malignancy, 159
NICODEMUS, ROY E., AND RITMILLER, LEROY F., An analysis of sterility studies in the female, 95
NORMANT, W. B., The use of a new contrast medium (visco-rayopake) in the female generative tract, 253
NORTON, JAMES F., A mortality study of 187 deaths in 66,376 live births, 554

P

PARKS, JOHN, Similarity of mouth and vulvar lesions, 396
— (WITH HUTTER, ADOLPH M.), The transmission of penicillin through the placenta, 663
PARKS, THOMAS J., Carcinoma of the ovary treated preoperatively with deep x-ray, 676
PASTORE, JOHN B., The Lying-In Hospital of New York, 294
POTTER, MILTON G., ERVING, HENRY W., AND BROWN, J. BRUCE, Observations on breech deliveries in a general hospital, 567
PRATT, J. P., AND SCHAEFER, ROBERT L., Sex precocity, virilism, adrenal cortical tumor, 623
PUND, EDGAR R. (WITH AUERBACH, S. H.), Squamous metaplasia of the cervix uteri, 207

Q

QUIGLEY, JAMES KNIGHT, Habitual abortion, 633
QUINN, ROBERT (WITH SAMPSON, JOHN J., AND ROSE, ELISE M.), Estimation of the work of obstetric labor and its significance in heart disease, 719

R

RANDALL, LAWRENCE M. (WITH MUSSEY, ROBERT D., AND DOYLE, LEO W.), Pregnancy following myomectomy, 508
REICH, WALTER J., AND NECHTOW, MITCHELL J., Cystic pelvic chordoma simulating an ovarian cyst, 265
REID, DUNCAN E. (WITH AABERG, MONRAD E.), Manual removal of the placenta, 368
RICE, PAUL M., Neisserian infection in pregnancy, 226
RITMILLER, LEROY F. (WITH NICODEMUS, ROY E.), An analysis of sterility studies in the female, 95
ROSE, ELISE M. (WITH SAMPSON, JOHN J., AND QUINN, ROBERT), Estimation of the work of obstetric labor and its significance in heart disease, 719
RUBIN, I. C., A demonstration model for uterotubal insufflation, 786

RUDOLPH, LOUIS (WITH KOBAK, ALFRED J., FITZGERALD, J. E., AND FREDA, VINCENT C.), Carcinoma of the cervix and pregnancy, 307
RUTHERFORD, ROBERT N., AND HERTIG, ARTHUR T., Noninvolution of the placental site, 378

S

SAMPSON, JOHN J., ROSE, ELISE M., AND QUINN, ROBERT, Estimation of the work of obstetric labor and its significance in heart disease, 719
SCHAEFER, ROBERT L. (WITH PRATT, J. P.), Sex precocity, virilism, adrenal cortical tumor, 623
SCOTT, ROGER B. (WITH EVERETT, HOUSTON S., AND STEPTOE, PHILIP P., JR.), The treatment of urinary infections with sulfasuxidine (succinylsulfathiazole), 114
SCOTT, WILLIAM A., Surgical complications during pregnancy and labor, 494
SEELEY, WARD F., A study of 250 cases of placenta previa, 85
SHEFFERY, JOSEPH B., Hysterosalpingography as a diagnostic aid in certain types of ruptured uteri, 423
SHELDON, DEAN E., Pregnancy complicated by Addison's disease, 269
SIDDALL, A. C., AND MULL, J. W., Thiamin status during pregnancy, 672
SIDDALL, ROGER S., Placental changes in toxemia of pregnancy, 304
—, Pregnancy after renal biopsy in hypertensive disease, 782
SONN, EVE B. (WITH SPECK, GEORGE), An intragroup hemolytic transfusion reaction in an Rh-positive patient, 273
SPECK, GEORGE, AND SONN, EVE B., An intragroup hemolytic transfusion reaction in an Rh-positive patient, 273
SPEISER, MORTIMER D., WEXLER, GERTRUDE, THOMAS, EVAN W., AND ASHER, HYMAN A., The rapid treatment of early syphilis during pregnancy, 214
STEINER, MELVIN D., Gangrene of an extremity in a newborn child, 686
STEPTOE, PHILIP P., JR. (WITH EVERETT, HOUSTON S., AND SCOTT, ROGER B.), The treatment of urinary infections with sulfasuxidine (succinylsulfathiazole), 114
STODDARD, F. JACKSON, Hirsutism in pregnancy, 417
STOLTZ, RODNEY, (WITH MENGERT, WILLIAM F.), Total abdominal hysterectomy, 603
STONE, SIDNEY J. (WITH MELODY, GEORGE F., AND FAULKNER, ROBERT L.), Adenoacanthoma of the ovary, 691
STRASSMANN, ERWIN O., Development and degeneration of ovum and follicle as observed by intravital staining, 343
STUDDIFORD, W. E., Cervical pregnancy. A partial review of the literature and a report of two probable cases, 169

T

TAYLOR, HOWARD C., JR. (WITH COHN, ALFRED, AND GRUNSTEIN, ISAAK), Penicillin treatment of sulfonamide-resistant gonococcal infections in the female, 657
THOMAS, EVAN W. (WITH SPEISER, MORTIMER D., WEXLER, GERTRUDE, AND ASHER, HYMAN A.), The rapid treatment of early syphilis during pregnancy, 214
THORP, ADAM T., Relaxation of constriction ring with adrenalin chloride in a cesarean section under spinal anesthesia, 821
TOMLINSON, WRAY J., Cortical necrosis of kidneys associated with necrosis of pituitary in obstetrical shock, 236
TORPIN, RICHARD, Placenta delivered five hours before birth of the fetus, 438

W

WATERS, EDWARD G., Supravesical extraperitoneal cesarean section (Waters' type). Experience with 250 operations, 739
WEINER, SAMUEL (WITH LEVINE, WILLIAM), Carcinoma following pregnancy with spontaneous cure, 778
WEXLER, GERTRUDE (WITH SPEISER, MORTIMER D., THOMAS, EVAN W., AND ASHER, HYMAN A.), The rapid treatment of early syphilis during pregnancy, 214
WHITACRE, FRANK E., AND CHEN, C. Y., Surgical treatment of absence of the vagina. Report of two cases, 789
WILLIAMS, PHILIP F., Analysis of mortalities following excision of the uterus at the Philadelphia General Hospital, 1931 to 1941 inclusive, 802
WILLSON, J. ROBERT, The action of veratrone on blood pressure, urine volume and urea clearance in the toxemias of pregnancy, 665

SUBJECT INDEX*

A

Abdominal hysterectomy, total (Mengert and Stoltz), 603
pregnancy (Dibbins), 597 (Abst.)
Abortion, attempted criminal, unusual sequel to (Bateman), 280
habitual (Quigley), 633
problem of, proceedings of conference held under auspices of National Committee on Maternal Health, June 19 and 20, 1942, 815 (B. rev.)
Abruptio placentae, management of (Gustafson), 103
Abstracts, extrauterine pregnancy, 299, 596
gynecology, 200, 596
labor, physiology, management, complications, 301, 442
newborn, 302, 443, 597
pregnancy, complications, 444, 712
physiology, diagnosis, 303, 710
toxemia, 448, 714
vaginal infections, 450
Addison's disease, pregnancy complicated by (Sheldon), 269
Adenoacanthoma of ovary (Melody et al.), 691
of uterus (Ayre), 261
Allergy, essentials of (Criep), 819 (B. rev.)
American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, papers of, 457-595, 603-646
Board of Obstetrics and Gynecology, examinations, 156, 306, 454, 600, 718, 822 (Items)
Gynecological Society, papers of, 1-143
Obstetrical and Gynecological Societies, roster of, 157, 601
woman (Groves), 820 (B. rev.)
Amino acids and proteins, outline of (Sahyun), 818 (B. rev.)
Androgenic therapy in malignant disease of female genitalia (Abel), 327
Anesthesia and analgesia, recent advances in (Hewer), 153 (B. rev.)
art of (Flagg), 153 (B. rev.)
caudal, catheter method for continuous (Downing et al.), 391
continuous (Leff), 717 (Cor.)
intravenous (Adams), 153 (B. rev.)
Appendicitis, chronic, and pregnancy (Coatz), 448 (Abst.)
postpartum (Timerman), 715 (Abst.)
Appendix, lithiasis of (Ribeiro), 154 (B. rev.)
Arteries, umbilical, benefit from early clamping of (Fortier), 304 (Cor.)

B

Birth of the Argentine quintuplets (Beruti), 301 (Abst.)
Births, live, mortality study of 187 deaths in 66,376 (Norton), 554
Blood pressure in labor (Radcliffe), 442 (Abst.)
vessels, uterine, injection study of (Faulkner), 1
Book reviews, endocrinology, 817
gynecology, 144
obstetrics, 148
and gynecology, 815
Boynton, Melbourne W., war casualty, 305
Breech deliveries, observations on, in general hospital (Potter et al.), 567
forceps, new (Brenner), 453 (Abst.)

C

Cancer, cervical, pelvic lymphadenectomy in treatment of (Morton), 19
of cervix, prevention of (Cashman), 190
Carcinoma following pregnancy, with spontaneous cure (Levine and Weiner), 778
of cervix and pregnancy (Kobak et al.), 307
Wertheim operation for (Meigs), 542
of ovary treated preoperatively with deep x-ray (Parks), 676
Caudal analgesia, continuous (Leff), 717 (Cor.)
anesthesia, continuous, catheter method for (Downing et al.), 391
Cervical cancer, pelvic lymphadenectomy in treatment of (Morton), 19
pregnancy (Studdiford), 169
Cervicitis, treatment of, end results in (Findley), 614
Cervix, cancer of, prevention of (Cashman), 190
carcinoma of, and pregnancy (Kobak et al.), 307
Wertheim operation for (Meigs), 542
intrauterine pessary in, pregnancy and delivery with (Welton and Ellingson), 442 (Abst.)
uteri, papillary lesions of, in pregnancy (Edmondson et al.), 356
squamous metaplasia of (Auerbach and Pund), 207
Cesarean section, bilateral, multilocular, pseudomucinous cysts of ovaries necessitating (Kanter), 428
history and development of, from earliest times (Young), 149 (B. rev.)
operations, five hundred consecutive (Free), 401
relaxation of constriction ring with adrenalin chloride in, under spinal anesthesia (Thorp), 821 (Cor.)
supravesical extraperitoneal (Waters' type), experience with 250 operations (Waters), 739
twenty-two years' experience with, critical analysis of (Johnston), 576
Waters' type, experience with 250 operations (Waters), 739
Chicago Lying-in Hospital (Dieckmann), 704
Childbirth, pain in, control of (Lull and Hingson), 816 (B. rev.)
without fear (Read), 150 (B. rev.)
Chordoma, cystic pelvic, simulating an ovarian cyst (Reich and Nechtow), 265
Clostridium welchii in female genital tract, occurrence and significance of (Salm), 715 (Abst.)
Constriction ring, relaxation of, with adrenalin chloride in cesarean section under spinal anesthesia (Thorp), 821 (Cor.)
Correspondence, 304, 717, 821
Cyst, ovarian, cystic pelvic chordoma simulating (Reich and Nechtow), 265
Cysts, bilateral, multilocular, pseudomucinous, of ovaries, necessitating cesarean section (Kanter), 428

D

Deliveries, breech, observations on, in general hospital (Potter et al.), 567
Delivery, early rising after, and service of obstetric assistance in home (Ferreira), 449 (Abst.)
special (Rosenberg), 151 (B. rev.)
Dentin, human, chemical composition of, effect of pregnancy on (Dragiff and Karshan), 711 (Abst.)
Diet in pregnancy (Sullivan), 712 (Abst.)
Dysmenorrhea, essential, treatment of (Decoppet), 299 (Abst.)
exercises in (Haman), 755
Dystrophia-dystocia syndrome (Delascio and Rudge), 446 (Abst.)

E

Eclampsia, conservative treatment of failure of (Huber), 81
experimental (Fuster), 713 (Abst.)
problem of, present aspects of (Araujo), 713 (Abst.)
therapeutic regimen for, based on 142 consecutive cases without maternal fatality (Arnell), 49
treatment of, new (Kunz), 712 (Abst.)

*January, pp. 1-158; February, pp. 159-306; March, pp. 307-454; April, pp. 455-602; May, pp. 603-718; June, pp. 719-822.

Ectopic pregnancy (Denoon and Henderson), 596 (Abst.)
Editorial, 797
Endocrine glands, diseases of (Zondek), 152 (B. rev.)
Endocrinology, 817 (B. revs.)
of woman (Hamblen), 817 (B. rev)
recent advances in (Cameron), 818 (B. rev.)
Endometriosis, treatment of, hysterectomy with preservation of ovarian tissue in (Cashman), 484
English national maternity service, report on (Eastman), 285
Ergonovine, posterior pituitary and, comparative action of, in third and fourth stages of labor (Leff), 734
Ergonovine-like oxytocic synthesized from lysergic acid (Kirchoff et al), 452 (Abst.)
Estrogens, application of, prolonged (Wattenwyl), 818 (B. rev.)
Exercises in dysmenorrhea (Haman), 755
Extracts from ovaries, clinical use of (Fluhman), 300 (Abst.)
Extrauterine fibromyomas (Scott and Scott), 596 (Abst.)
pregnancy, 299 (Absts.)

F

Fallopian tube, spontaneous amputation of, during adolescence, torsion of apparently normal ovary, and (Anderson), 283
Female generative tract, use of new contrast medium (visco-rayopake) in (Norment), 253
genitalia, malignant disease of, adrogenic therapy in (Abel), 327
sterility studies in, analysis of (Nicodemus and Ritmiller), 95
Fertility, human, problems of, proceedings of conference on, 148 (B. rev.)
in man (Hotchkiss), 145 (B. rev.)
in women (Siegler), 145 (B. rev.)
Fetal death, diagnosis of, by determination of coagulation time of maternal blood (Bottiroli), 444 (Abst.)
erythroblastosis, hemoagglutinogen Rh and (Vaccaro and Meza), 447 (Abst.)
gigantism at the Maternity Concepcion Palacios (Paz Silva), 302 (Abst.)
Fetus adipocere monster (Gill), 440
dead, clinic of (Noyola), 446 (Abst.)
Fibromyomas, extrauterine (Scott and Scott), 596 (Abst.)
Fistula, vesico-uterine, postoperative (Frank), 776
Forceps, nev breech (Brenner), 453 (Abst.)
Friedman test for pregnancy, false negative results in (Buxton), 710 (Abst.)
Frog test for pregnancy (Weisman and Coates), 712 (Abst.)

G

Gallstones, pregnancy and (Robertson and Dochat), 443 (Abst.)
Gangrene of extremity in newborn child (Steiner), 686
Generative tract, female, use of new contrast medium (visco-rayopake) in (Norment), 253
Genital examination, early signs of pregnancy revealed by (Sisco and Agüero), 303 (Abst.)
Genitalia, female, malignant disease of, androgenic therapy in (Abel), 327
Glycogen, relationship of, to problems of sterility and ovular life (Hughes), 10
Golden book (Bottaro), 155 (B. rev.)
Gonococcal infection in women, sulfonamide therapy in (Hesseltine et al.), 746
Greenhill's year book (1943), 150 (B. rev.)
Gynecological therapy (Calatroni and Ruiz), 147 (B. rev.)
Gynecology, 300, 596 (Absts.)
Forsdike's textbook of, 147 (B. rev.)
Greenhill's year book (1943), 150 (B. rev.)
history of (Leonardo), 147 (B. rev.)
Novak's textbook of, 146 (B. rev.)
review of new books on, 144, 815
sulfonamide therapy in (Dutra), 451 (Abst.)

H

Habitual abortion (Quigley), 633
Heart disease, estimation of work of obstetric labor and its significance in (Sampson and Quinn), 719
rate, fetal and maternal, differential diagnosis between (Berlind), 703
Hematomas, postpartum (Lubin and Horowitz,) 715 (Abst.)
Hemoagglutinogen Rh and fetal erythroblastosis (Vaccaro and Meza), 447 (Abst.)
Hemorrhage, obstetric, massive, requiring hysterectomy (Hunt), 246
Hemotherapy in pernicious vomiting (Duek), 444 (Abst.)
Hepburn operation, prolapse of urethra treated by (Miller), 591
Hirsutism in pregnancy (Stoddard), 417
Hospital, Chicago Lying-in (Dieckmann), 704
Lying-In, of New York (Pastore), 294
Margaret Hague Maternity, Jersey City, N. J., 798
Hydronephrosis and pyelitis of pregnancy (Robertson), 148 (B. rev.)
Hypertensive disease, renal biopsy in, pregnancy after (Siddall), 782
Hypoprothrombinemia in newborn infant, water-soluble vitamin K substance in prevention of, studies on minimal effective dose of (Hardwicke), 443 (Abst.)
Hysterectomy, abdominal, total (Mengert and Stoltz), 603
massive obstetric hemorrhage requiring (Hunt), 246
with preservation of ovarian tissue in treatment of endometriosis (Cashman), 484
Hysterosalpingography as diagnostic aid in certain types of ruptured uteri (Sheffery), 423
x-ray studies in, using new cannula (Hudgins), 431

I

In memorian—Frank Worthington Lynch, 455
Infection, gonococcal, in women, sulfonamide therapy in (Hesseltine et al.), 746
Neisserian, in pregnancy (Rice), 226
pelvic reactions to (Barrett and Lash), 596 (Abst.)
puerperal, thirty cases of (Carvalho), 151 (B. rev.)
urinary, treatment of, with sulfasuxidine (succinylsulfathiazole) (Everett et al.), 114
uterine defense mechanism against (Goodall), 532
vaginal, 450 (Absts.)
Injection study of uterine blood vessels (Faulkner), 1
Insufflation, uterotubal, demonstration model for (Rubin), 786
Intragroup hemolytic transfusion reaction in Rh-positive patient (Speck and Sonn), 273
Intravital staining, development and degeneration of ovum and follicle as observed by (Strassmann), 343
Iso-immunization by Rh factor, recent developments in (Levine), 810
Items, 305, 454, 600, 718, 822

K

Kidney, incarcerated pelvic, exhibiting unusual features (Stegeman), 300 (Abst.)
pelvic, right, and ureter, duplication of, with extravesical ureteral opening (Moe), 641
Kidneys, cortical necrosis of, associated with necrosis of pituitary in obstetrical shock (Tomlinson), 236

L

Labor, blood pressure in (Radcliffe), 442 (Abst.)
intermittent contractions of uterus, in process of, role of (Murphy), 186
physiology, management, complications, 301, 442 (Absts.)
puerperium, newborn, pathology of (McCormick), 815 (B. rev.)
surgical complications during pregnancy and (Scott), 494
third and fourth stages of, comparative action of posterior pituitary and ergonovine in (Leff), 734
Laboratory technic, approved (Kolmer), 819 (B. rev.)
Lactation, influence of stilbestrol upon (Fields), 385
suppression of, by stilbestrol (Bloom), 715 (Abst.)
Lesions, mouth and vulvar, similarity of (Parks), 396
Leucoplasia vulvar (Filho), 817 (B. rev.)

Lithiasis of appendix (Ribeiro), 154 (B. rev.)
Lóránd tocograph, observations of intermittent contractions of uterus in process of labor made with (Murphy), 186
Lying-In Hospital of New York (Pastore), 294
Lymphadenectomy, pelvic, in treatment of cervical cancer (Morton), 19
Lymphogranulomatous parametritis and pelvic cellulitis (Da Costa), 300 (Abst.)

M

Magnesium ions, spasmolysant action of, on tetanically contracting human gravid uterus (Abarbanel), 473
Malignancy, early, vaginal smears in diagnosis of (Jones et al.), 159
Malignant disease of female genitalia, androgenic therapy in (Abel), 327
Marcus Tullius Cicero (Loomis), 598 (Abst.)
Margaret Hague Maternity Hospital, Jersey City, N. J., 798
Maternal morbidity, study of (Cummings), 409
Maternity care in United States—planning for future (Daily), 128
service, English national, report on (Eastman), 285
Medical dictionary, Dorland's, twentieth edition of, 155 (B. rev.)
Metaplasia, squamous, of cervix uteri (Auerbach and Pund), 207
Monster, fetus adipocere (Gill), 440
Morbidity, maternal, study of (Cummings), 409
Mortality study of 187 deaths in 66,376 live births (Norton), 554
Myomectomy and pregnancy (Da Costa), 445 (Abst.)
pregnancy following (Mussey et al.), 508

N

Necrology, Conaway, Walter Ponder, 306
Latzko, William, 454
Lynch, Frank Worthington, 306
McNeile, Lyle G., 716
Miller, Hilliard Eve, 716
Titus, Elijah White, 156
Necrosis, cortical, of kidneys associated with necrosis of pituitary in obstetrical shock (Tomlinson), 236
Neisserian infection in pregnancy (Rice), 226
Neonatal mortality, care of parturient woman in relation to (Sage), 448 (Abst.)
New York, Lying-In Hospital of (Pastore), 294
Newborn, 302, 443, 597 (Absts.)
gangrene of extremity in (Steiner), 686
infant, hemolytic disease of (Taylor and Race), 597 (Abst.)
hypoprothrombinemia in, prevention of, studies on minimal effective dose of water-soluble vitamin K substitute in (Hardwicke), 443 (Abst.)
ovarian cyst in (Bulfamonte), 443 (Abst.)

O

Obstetric and obstetric-gynecologic specialization (Leon), 452 (Abst.)
hemorrhage, massive, requiring hysterectomy (Hunt), 246
labor, estimation of work of, and its significance in heart disease (Sampson and Quinn), 719
shock, necrosis of pituitary in, cortical necrosis of kidneys associated with (Tomlinson), 236
Obstetrics and gynecology, books on, review of, 148, 815
textbook of, combined (Kerr), 816 (B. rev.)
year book of, 1944 (Greenhill), 816 (B. rev.)
for nurses (DeLee's), 151 (B. rev.)
Greenhill's year book (1943), 150 (B. rev.)
sulfonamide therapy in (Dutra), 451 (Abst.)
vagaries and historical backgrounds in (Schauffler), 598 (Abst.)
Omphalocele (aminocele), anatomy and etiology in relation to hernias of umbilicus and umbilical cord (Margulies), 695
Operations, cesarean section, five hundred consecutive (Free), 401
Ophthalmia neonatorum, sulfonamides in (Sorsby and Hoffa), 302 (Abst.)
Otosclerosis, pregnancy and (Allen), 32
Ovarian adhesions, origin of, from organized liquor folliculi in Rhesus monkey (Hartman), 599 (Abst.)
cyst, cystic pelvic chordoma simulating (Reich and Nechtow), 265
large, in newborn child (Bulfamonte), 443 (Abst.)
cysts, bilateral, multilocular, pseudomucinous, necessitating cesarean section (Kanter), 428
pregnancy, primary (Eckerson), 445 (Abst.)
tissue, preservation of, hysterectomy with, in treatment of endometriosis (Cashman), 484
Ovaries, extracts from, clinical use of (Fluhman), 300 (Abst.)
Ovary, adenoacanthoma of (Melody et al.), 691
carcinoma of, treated preoperatively with deep x-ray (Parks), 676
torsion of apparently normal, and spontaneous amputation of Fallopian tube during adolescence (Anderson), 283
Ovular life and sterility, relationship of glycogen to problems of (Hughes), 10
Ovum and follicle, development and degeneration of, as observed by intravital staining (Strassmann), 343

P

Pain in childbirth, control of (Lull and Hingson), 816 (B. rev.)
mechanisms (Livingston), 151 (B. rev.)
Pancreatic achylia, relation of, to meconium ileus (Farber), 597 (Abst.)
Papillary lesions of cervix uteri in pregnancy (Edmondson et al.), 356
Parturient woman, care of, in relation to neonatal mortality (Sage), 448 (Abst.)
Pathology of labor, puerperium, and newborn (McCormick), 815 (B. Rev.)
Pelvic lymphadenectomy in treatment of cervical cancer (Morton), 19
reactions to infection (Barrett and Lash), 596 (Abst.)
Penicillin, transmission of, through placenta (Hutter and Parks), 663
treatment of sulfonamide-resistant gonococcal infections in female (Cohn et al.), 657
Pituitary, necrosis of, in obstetrical shock, cortical necrosis of kidneys associated with (Tomlinson), 236
posterior, and ergonovine, comparative action of, in third and fourth stages of labor (Leff), 734
Placenta delivered five hours before birth of fetus (Torpin), 438
manual removal of (Aaberg and Reid), 368
previa, study of 250 cases of (Seeley), 85
transmission of penicillin through (Hutter and Parks), 663
Placental changes in toxemia of pregnancy (Siddall), 304 (Cor.)
delivery, rectal maneuver for (Greenberg), 700
site, noninvolution of (Rutherford and Hertig), 378
Plasma, human, and serum toxicity (State and Levine), 453 (Abst.)
Plastic surgery, chronology of evolution of (Maltz), 154 (B. rev.)
Podalic and transverse presentations, version by purgation and enema in (Torres), 302 (Abst.)
Postmenopausal pruritus vulvae (Cinberg), 647
Postpartum appendicitis (Timerman), 715 (Abst.)
hematomas (Lubin and Horowitz), 715 (Abst.)
Pregnancy, abdominal (Dibbins), 597 (Abst.)
after renal biopsy in hypertensive disease (Siddall), 782
and delivery with intrauterine pessary in cervix (Welton and Ellingson), 442 (Abst.)
and gallstones (Robertson and Dochat), 443 (Abst.)
and labor, surgical complications during (Scott), 494
and otosclerosis (Allen), 32
carcinoma following, with spontaneous cure (Levine and Weiner), 778
of cervix and (Kobak et al.), 307
cervical (Studdiford), 169
chronic appendicitis and (Coatz), 448 (Abst.)
complicated by Addison's disease (Sheldon), 269
complications, 444, 712 (Absts.)

Pregnancy—Cont'd
diagnosis, South African frog (Xenopus laevis) in, (Weisman and Coates), 149 (B. rev.)
diet in (Sullivan), 712 (Abst.)
double ova, in which Rh positive twin developed erythroblastosis (Potter), 444 (Abst.)
early signs of, revealed by genital examination (Sisco and Agüero), 303 (Abst.)
ectopic (Denoon and Henderson), 596 (Abst.)
effect of, on chemical composition of human dentin (Dragiff and Karshan), 711 (Abst.)
extrauterine, 299, 596 (Absts.)
following myomectomy (Mussey et al.), 508
Friedman test for, false negative results in (Buxton), 710 (Abst.)
frog test for (Weisman and Coates), 712 (Abst.)
hirsutism in (Stoddard), 417
hydronephrosis and pyelitis of (Robertson), 148 (B. rev.)
in rudimentary horn of uterus (Mulsow), 773
interstitial tubal (Alvarez and Boullon), 299 (Abst.)
multiple (Chavanne and Pittaluga), 711 (Abst.)
myomectomy and (Da Costa), 445 (Abst.)
Neisserian infection in (Rice), 226
papillary lesions of cervix uteri in (Edmondson et al.), 356
physiology, diagnosis, 303, 710 (Absts.)
primary ovarian (Eckerson), 445 (Abst.)
syphilis during, early rapid treatment of (Speiser et al.), 214
therapeutic interruption of (Kuder and Finn), 762
thiamin status during (Siddall and Mull), 672
thiourea treatment in, analysis of effects of continued, on development of offspring in rat (Goldsmith et al.), 197
toxemia of, placental changes in (Siddall), 304 (Cor.)
toxemias of, action of veratrone on blood pressure, urine volume, and urea clearance in (Willson), 665
uterine myoma and (Zuckermann), 445 (Abst.)
Pregnant women, supervision of, in factory employment (O'Sullivan and Bourne), 451 (Abst.)
Prolapse of urethra treated by Hepburn operation (Miller), 591
Pruritus vulvae, postmenopausal (Cinberg), 647
Psychiatric novels of Oliver Wendell Holmes (Oberndorf), 819 (B. rev.)
Psychology of American woman, differential (Cooke), 457
of women, (Deutsch), 820 (B. rev.)
Puerperal fever postpartum infection of genital canal (Gonzales), 714 (Abst.)
infection, revision of uterine cavity as prophylaxis against (Da Costa), 449 (Abst.)
thirty cases of (Carvalho), 151 (B. rev.)
thrombophlebitis, treatment of pulmonary embolism complicating (Dubrovsky and Linzoain), 448 (Abst.)
Puerperium, early rising in (Armand), 714 (Abst.)
Pyelitis and hydronephrosis of pregnancy (Robertson), 148 (B. rev.)

Q

Quintuplets, Argentine, birth of (Beruti), 301 (Abst.)

R

Rectal maneuver for placental delivery (Greenberg), 700
Retractor, vaginal, new self-retaining (Guttmann), 436
Rh factor again, 797 (Editorial)
and prognosis (Henry), 715 (Abst.)
in blood of Australian aborigines (Simmons et al.), 716 (Abst.)
iso-immunization by recent developments in (Levine), 810
Rh-positive patient, intragroup hemolytic transfusion reaction in (Speck and Sonn), 273
Rupture of uterus (Lynch), 514

S

Sex precocity, virilism, adrenal cortical tumor (Pratt and Schaefer), 623
Sexual anomalies (Hirschfeld), 152 (B. rev.)
Soap, medical uses of (Fishbein), 821 (B. rev.)
Squamous metaplasia of cervix uteri (Auerbach and Pund), 207
Sterility, and ovular life, relationship of glycogen to problems of (Hughes), 10
studies in female, analysis of (Nicodemus and Ritmiller), 95
Stilbestrol, influence of, on lactation (Fields), 385
suppression of lactation by (Bloom), 715 (Abst.)
Succinylsulfathiazole (sulfasuxidine), treatment of urinary infections with (Everett et al.), 114
Sulfasuxidine (succinylsulfathiazole), treatment of urinary infections with (Everett et al.), 114
Sulfonamide therapy by transplacental route (Gabastou), 714 (Abst.)
in gonococcal infection in women (Hesseltine et al.), 746
in gynecology and obstetrics (Dutra), 451 (Abst.)
Sulfonamide-resistant gonococcal infections in female, penicillin treatment of (Cohn et al.), 657
Sulfonamides in ophthalmia neonatorum (Sorsby and Hoffa), 302 (Abst.)
Surgery, minor (Rolleston and Moncrieff), 153 (B. rev.)
plastic, chronology of evolution of (Maltz), 154 (B. rev.)
Syphilis, early, rapid treatment of, during pregnancy (Speiser et al.), 214

T

Textbook of obstetrics and gynecology, combined (Kerr), 816 (B. rev.)
Therapeutic regimen for eclampsia (Arnell), 49
Thiamin status during pregnancy (Siddall and Mull), 672
Thiourea treatment in pregnancy, continued, effects of, on development of offspring in rat (Goldsmith et al.), 197
Thoracopagus twins—x-ray diagnosis (Graber), 276
Thrombophlebitis, puerperal, treatment of pulmonary embolism complicating (Dubrovsky and Linzoain), 448 (Abst.)
Tocograph, Lóránd, observations of intermittent contractions of uterus in process of labor made with (Murphy), 186
Toxemia, 448, 714 (Absts.)
of pregnancy, action of veratrone on blood pressure, urine volume and urea clearance in (Willson), 665
placental changes in (Siddall), 304 (Cor.)
Transverse and oblique positions, study of, with special reference to their roentgen diagnosis (Beruti et al.), 710 (Abst.)
Trichomonas vaginalis, treatment of (Dos Santos and Zagury), 451 (Abst.)
vaginitis, effective treatment of (Dubois), 450 (Abst.)
treatment of (Rieper), 450 (Abst.)
Tubal pregnancy, interstitial (Alvarez and Boullon), 299 (Abst.)
Tumors, benign pelvic, urinary tract changes with (Chamberlin and Payne), 300 (Abst.)
Twins, thoracopagus, x-ray diagnosis (Graber), 276

U

Umbilical arteries, benefit from early clamping of (Fortier), 304 (Cor.)
Unborn, ourselves. An embryologist's essay on man (Corner), 145 (B. rev.)
Urethra, prolapse of, treated by Hepburn operation (Miller), 591
Urinary infections, treatment of, with sulfasuxidine (succinylsulfathiazole) (Everett et al.), 114
tract changes with benign pelvic tumors (Chamberlin and Payne), 300 (Abst.)
Urology, gynecological and obstetrical (Everett), 144 (B. rev.)
Uteri, ruptured, hysterosalpingography as diagnostic aid in certain types of (Sheffery), 423

Uterine blood vessels, injection study of (Faulkner), 1
cavity, revision of, as prophylaxis against puerperal infection (Da Costa), 449 (Abst.)
cervix, virus infections of (Coutts), 450 (Abst.)
defense mechanism against infection (Goodall), 532
myoma and pregnancy (Zuckermann), 445 (Abst.)
Uterotubal insufflation, demonstration model for (Rubin), 786
Uterus, adenoacanthoma of (Ayre), 261
excision of, mortalities following, analysis of, at Philadelphia General Hospital, 1931 to 1941 inclusive (Williams), 802
gravid, tetanically contracting human spasmolysant action of magnesium ions on (Abarbanel), 473
intermittent contractions of, role of, in process of labor (Murphy), 186
inversion of (Norton), 442 (Abst.)
rudimentary horn of, pregnancy in (Mulsow), 773
rupture of (Lynch), 514

V

Vagina, absence of, surgical treatment of (Whitacre and Chen), 789
virus infections of (Coutts et al.), 450 (Abst.)
Vaginal infections, 450 (Absts.)
retractor, new self-retaining (Guttmann), 436
smears, value of, in diagnosis of early malignancy (Jones et al.), 159
Vaginalis, trichomonas, treatment of (Dos Santos and Zagury), 451 (Abst.)
Vaginitis, trichomonas vaginalis, effective treatment of (Dubois), 450 (Abst.)
treatment of (Rieper), 450 (Abst.)
Version by purgation and enema in podalic and transverse presentations (Torres), 302 (Abst.)
Vesico-uterine fistula, postoperative (Frank), 776
Visco-rayopake, new contrast medium, use of, in female generative tract (Norment), 253
Vomiting, pernicious, hemotherapy in (Duek), 444 (Abst.)
Vulva, virus infections of (Coutts et al.), 450 (Abst.)
Vulvar lesions, similarity of mouth and (Parks), 396

W

War casualty, Melbourne W. Boynton, 305
Weight of Negro infants (Bakwin and Patrick), 443 (Abst.)
Wertheim operation for carcinoma of cervix (Meigs), 542
Woman, American (Groves), 820 (B. rev.)
differential psychology of (Cooke), 457
asks doctor (Novak), 816 (B. rev.)
endocrinology of (Hamblen), 817 (B. rev.)
Women and men (Scheinfeld), 820 (B. rev.)
psychology of (Deutsch), 820 (B. rev.)

X

Xenopus laevis (South African frog) in pregnancy diagnosis (Weisman and Coates), 149 (B. rev.)
X-ray, deep, carcinoma of ovary treated preoperatively with (Parks), 676
diagnosis, thoracopagus twins (Graber), 276
studies in hysterosalpingography, using new cannula (Hudgins), 431

Y

Year book of obstetrics and gynecology, 1944 (Greenhill), 816 (B. rev.)

INDEX TO ADVERTISERS

Please mention "The American Journal of Obstetrics and Gynecology" when writing to advertisers—it identifies you

Abbott Laboratories ---------- 13
American Cystoscope Makers, Inc. --- 37
Articles to Appear in Early Issues --- 42
Ayerst, McKenna & Harrison Limited-A-2

Back Issues Wanted ---------- 48
Barnes Company, A. C. ---------- 2
Borden's Prescription Products ----------Fourth Cover
Bristol-Myers Company ---------- 34
Burroughs Wellcome & Co. (U.S.A.) Inc. ---------- 14

Camp & Company, S. H. ---------- 5
Carnrick Co., G. W. ---------- 40
Chicago Pharmacal Company, The --- 42
Ciba Pharmaceutical Products, Inc. ----------Second Cover
Corn Products Refining Company ----A-6
Cream of Wheat Corporation, The --- 28

Davis & Geck, Inc. ----------Insert between pp. 2 and 3
Davol Rubber Company ----------A-7

Ethicon Suture Laboratories ---------- 49

Glidden & Co., Inc., Otis E. ---------- 45

Harrower Laboratory, Inc., The ----- 36
Hoffmann-La Roche, Inc. ----------A-1
Holland-Rantos Company, Inc. ------- 30
Horlick's Malted Milk Corporation --- 18
Hygeia Nursing Bottle Co., Inc. ------ 41

Iodine Educational Bureau, Inc. ------ 41

Johnson & Johnson ---------- 33
Journal of Obstetrics and Gynaecology of the British Empire, The -------- 48

Lederle Laboratories, Inc. ---------- 12
Leeming & Co., Inc., Thos. ---------- 27
Lilly and Company, Eli ---------- 50

Maiden Form Brassiere Company, Inc. 38
M & R Dietetic Laboratories, Inc. ---A-3

McNeil Laboratories, Inc. ---------- 20
Mead Johnson & Company ---------- 1
Mennen Antiseptic Oil ---------- 38
Merck & Co., Inc. ---------- 24
Merrell Company, The Wm. S. ------ 23

National Confectioners' Association (Council on Candy) ---------- 32
National Drug Company ----------A-5
Nestlé's Milk Products, Inc. --------- 22

Ohio Chemical & Mfg. Company, The 15
Ortho Products, Inc. ---------- 54

Parke, Davis & Company ---------- 4
Poythress & Co., Inc., Wm. P. ------ 43

Richardson, Bond & Wright, Publishers 48
Robins Co., Inc., A. H. ---------- 25
Roche-Organon, Inc. ---------- 7
Roerig & Co., J. B. ---------- 19

Schering Corporation ---------- 39
Schieffelin & Company ---------- 36
Schmid, Inc., Julius ---------- 26
Searle & Co., G. D. ---------- 9
Spencer Incorporated ---------- 3
Squibb & Sons, E. R. ----------A-8, 35
Stearns & Company, Frederick ------- 17

Tablax Company ---------- 38
Tampax Incorporated ---------- 31
Trimble ---------- 40

United Fruit Company ---------- 47
Upjohn Company, The ---------- 10

Walker Vitamin Products, Inc. ------ 21
War Bonds ---------- 52
Warner & Company, Inc., William R. 29
White Laboratories, Inc. ---------- 11
Whittaker Laboratories, Inc. --------- 40
Winthrop Chemical Company, Inc. --- 51
Wyeth Incorporated ----------A-4, 46

Young & Co., F. E. ---------- 16

All possible care is exercised in the preparation of this index. The publishers are not responsible for any errors or omissions

"you certainly 'measure-up', young lady"

The physician prescribing Biolac is certain of this... the nutrition of his Biolac Babies "measures-up" to optimum standards.

For Biolac (supplemented with vitamin C) is a *complete* infant formula. Adequate vitamins A, B_1, B_2 and D, as well as iron and carbohydrate eliminate calculating extra formula ingredients. The high-protein level of Biolac provides for normal growth and optimum health. Because of the scientifically adjusted milk-fat content, Biolac is readily assimilated—with a minimum of fat upsets. Small, soft curds and ample lactose assure ease of digestion and a natural stool closely resembling that from human milk.

BORDEN'S PRESCRIPTION PRODUCTS DIVISION
350 MADISON AVENUE · · NEW YORK 17, N. Y.

Easily calculated... quickly prepared. 1 fl. oz. Biolac to 1½ fl. oz. water per pound of body weight.

Biolac is a liquid modified milk, prepared from whole and skim milks, with added lactose, and fortified with vitamin B_1 concentrate of vitamins A and D from cod liver oil, and ferrous citrate. Evaporated, homogenized and sterilized. Vitamin C supplementation only is necessary. Available in 13 fl. oz. cans at all drug stores.

Biolac—"BABY TALK" FOR A GOOD SQUARE MEAL